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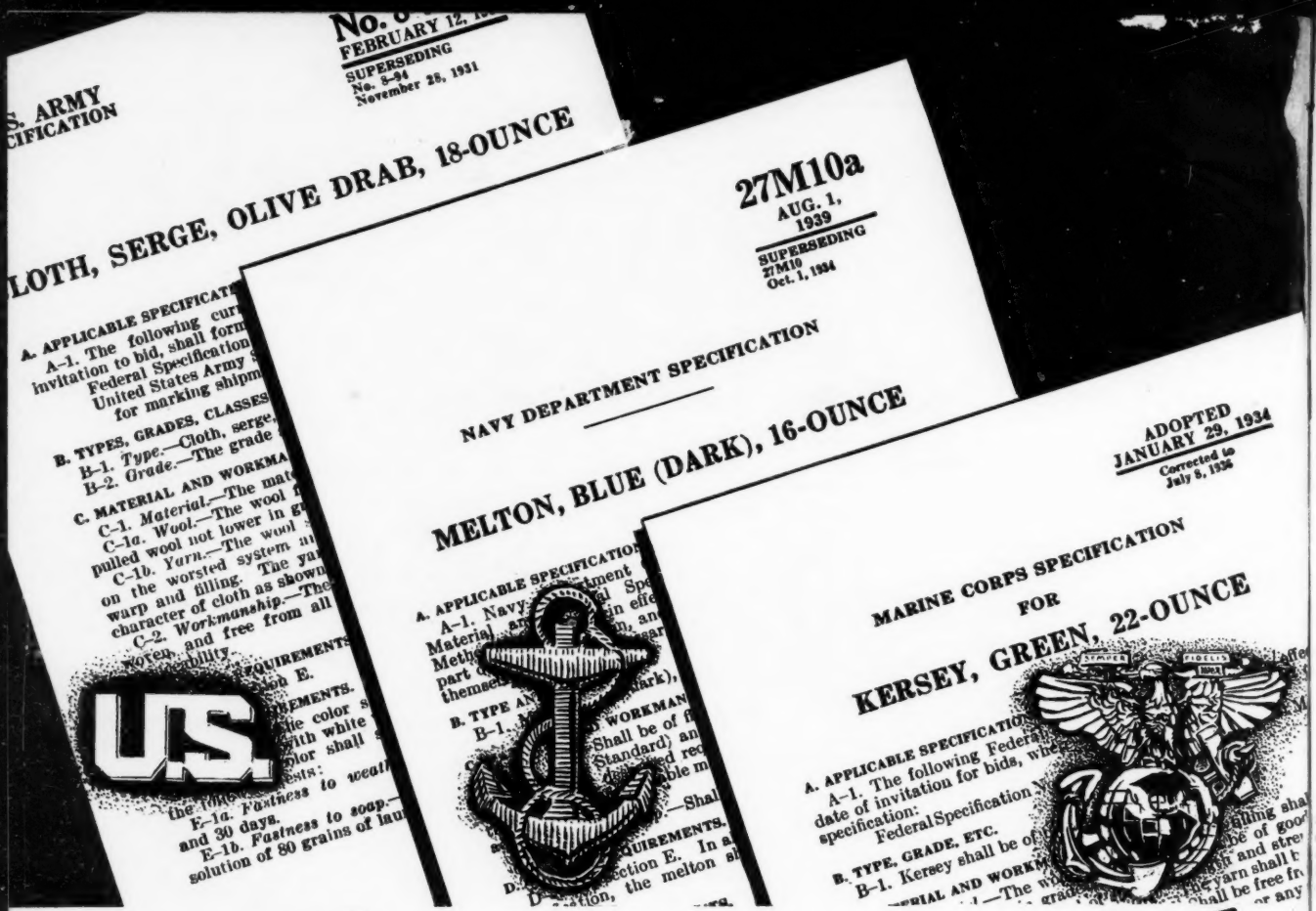

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VOLUME 30 JANUARY 6, 1941 NUMBER 1

WETTING AGENTS

THEIR STRUCTURE, CHARACTERISTICS AND USES*

C. A. SLUHAN**

ABSTRACT

The author deals with the general subject of surface active chemicals as applied to wetting, dispersing, and detergency. It is pointed out that these operations are distinct and separate, although detergency does involve wetting and dispersing action.

It is shown that wetting agents differ in molecular configuration from detergent type products or dispersing agents. The structure of the molecule with its attendant effect on wetting power, solubility, and foaming is also discussed.

Comparison is made of anion and cation surface active chemicals and a number of applications in various industries is cited. The importance of selecting the proper type of surface active chemical for applications of wetting, dispersing, or detergency is emphasized.

IN dealing with the subject of wetting agents, it would perhaps be best to first review the natural phenomenon known as surface tension, which makes wetting agents so necessary and valuable to industry. You are aware that a stream of a liquid will break into small drops, forming almost perfect spheres. A sphere, of course, has the least surface area per unit of volume, and the reason the liquid forms into drops is that the molecules of the liquid pull upon one another in such a manner as to create a tension acting parallel to the surface, and such being the case, the liquid will tend to assume a shape with the least surface area. The greater the attraction of these molecules for one another, the greater the surface tension, and the greater will be the amount of work necessary in extending the surface. This amount of work is specific for each liquid at a definite temperature. Numerically, it is expressed as dynes per centimeter, which is equivalent to saying that it is the work in ergs required to increase the surface area by one square centimeter. Perhaps it will be best to show what this surface tension will actually do.

If we take a toy battleship which has a lower structure of fine wire screen and place it on water, it will float because of the high surface tension of the water and the high angle of contact between the water and the wire. However, when we add a wetting agent, it sinks immediately, because the surface tension of the water is reduced and the wire becomes wet[1].

Surface tension deals with the relation of liquids to air or gases. However, wetting agents are generally used in water which in turn is used in connection with other liquids or solids. The surface tension at the interface between two immiscible liquids, or a liquid and a solid is known as "interfacial tension." Wetting is the phenomenon of a liquid and a solid coming into contact so as to form a liquid-solid interface. Wetting is generally considered complete when the contact angle between the two surfaces is zero. Generally speaking, the lower the interfacial tension, the more rapid is the wetting.

Ethyl alcohol is an excellent wetting and penetrating agent, however, large quantities must be used to obtain the desired results[2], but one of the advantages of the true wetting agents is that only relatively small quantities are necessary as shown in Table I.

TABLE I
25 Deg. C.

Decersol† *OT*-100% %	*Surface Tension dynes/cm.*	*Ethyl Alcohol* (2) %	*Surface Tension dynes/cm.*
1.0	26.8	75.68	25.0
0.5	27.3	61.10	26.7
0.1	28.0	43.64	28.5
0.05	32.0	29.67	33.1
0.01	40.5	15.93	41.8
0.005	43.7	5.94	54.0
0.001	49.4	2.33	60.8

From these data, it can readily be seen that exceedingly high concentrations of alcohol must be used in order to obtain a low surface tension, and thus to obtain satisfactory wetting.

In what way then, do wetting agents work in order to achieve such outstanding results?

*Presented at the meeting of the Delaware Valley Section of the Technical Association of the Pulp and Paper Industry, Engineers Club, Philadelphia, Pa., May 10, 1940. Reprinted from Paper Trade Journal.

**American Cyanamid & Chemical Corporation, 30 Rockefeller Plaza, New York, N. Y.

†In the original article, the wetting agent mentioned above was designated as Aerosol OT, which name is used in certain other industries. This will explain the use of the word Aerosol in the illustrations, which were prepared for the original article.

In order to understand their behavior, it would be well for us to examine their chemical nature. Broadly speaking, there are two extreme types of chemical compounds, polar and nonpolar, whose properties[3] are shown in Table II.

TABLE II
Polar-Nonpolar Compounds

Polar (Salt)	*Nonpolar (Nujol)*
Ionized	Nonionized
High Dielectric Constant	Low Dielectric Constant
High Melting Point	Low Melting Point
Soluble in Water	Insoluble in Water
Insoluble in Organic Solvents	Soluble in Organic Solvents
High Boiling Point	Low Boiling Point
Melt Conducts Electricity	Melt does not Conduct Electricity

STRUCTURE OF SURFACE ACTIVE MATERIALS

Wetting agents are in the class of heteropolar or polar-nonpolar compounds and have properties intermediate between these two types. They are composed of both polar and nonpolar groups. Some approach the polar and others the nonpolar compounds, depending upon the "balance" or ratio of the polar to the nonpolar portions. Langmuir's[4] work shows us that the polar portion has the tendency to direct the molecule into the water, whereas the oil-soluble or non-polar portion will be attracted to any surfaces with which their water solution comes into contact. In ordinary solution, with air or gas as the contacting surface, the oil-soluble portion is directed against the air, whereas the polar or water-soluble portion is directed towards the water. When a wetting agent is added to water, *a new surface is formed* which is oil-like in character, having a much lower surface tension than plain water. The popular definition of a wetting agent therefore is a material, which when added to water in small amounts will cause considerable reduction in surface tension.

To show the effect of adding a wetting agent to water, dip a piece of paraffin paper in a water solution of a dyestuff, the dyestuff being used to identify the position of the water after withdrawing the paper. You will note that in withdrawing the paper, the water runs off readily. Now add a wetting agent to the water, immerse the paper, and upon withdrawing it, note that the paper is readily wet by the solution. What actually happens is that the oil-soluble portion of the wetting agent molecule is attracted to the paraffin, because the paraffin is nonpolar in character, and the polar or water soluble group of this same molecule pulls the water along with it.

Wetting agents as a whole will reduce the surface tension of water markedly when used in low concentrations, but relatively few materials can raise the surface tension of water. Even in those cases, the surface tension of water cannot be raised to any great extent, and when such is possible, large amounts of the materials are necessary. Usually such materials are inorganic in nature, as for example salts, acids, and the like.

WETTING VS. DISPERSING

There seems to be considerable confusion as regards the terms "wetting" and "dispersing." As stated previously, a *wetting* agent is a material which will reduce the surface tension of water and lower the interfacial tension between the water and another surface, so as to form a solid-liquid, or liquid-liquid, interface. On the other hand, a true *dispersing* agent usually has little effect on the surface tension of water. This is shown by the following experiment.

If we place sulfur on ordinary water, it floats; but if a wetting agent is added to the surface of the water, you note that the sulfur sinks immediately. In another beaker, place sulfur on water and to it add a typical dispersing agent. You will note that the sulfur does not sink, because the interfacial tension between the sulfur and the water is not sufficiently reduced. In a further experiment, add carbon-black to ordinary water. You will note that it is wet fairly readily, but that it soon settles out. Add carbon-black to a dilute solution of a wetting agent, and you will note that it also wets readily, but that most of it soon settles in fairly large particles. Now add carbon-black to water and after it is wet, add a dispersing agent. You will notice at once that the mixture is considerably darker than the other mixtures, which results from the fact that the carbon-black particles are much smaller and remain in suspension.

An aqueous dispersing agent is a material which promotes the separation or deflocculation of particles, which is accomplished by overcoming the adhesive forces between the individual particles. From these experiments, it is seen that a wetting agent is not necessarily a dispersing agent, although some wetting agents do have some dispersing power as a secondary nature. While there are many products having wetting properties, there are relatively few true dispersing agents. Then, too, the action of dispersing agents is specific, their effectiveness depending upon the particular system. Dispersing agents may be inorganic in nature or complex polar-nonpolar compounds.

WETTING POWER AND MOLECULAR CONFIGURATION

"Wetting power" is a relative term. Since this is the case, it is necessary to measure the effectiveness of a given material in terms of what it will do in comparison to other materials. In the textile industry, the most widely used test method is that of Draves and Clarkson. It consists of measuring the time necessary for a 5-gram skein of unboiled two-ply cotton yarn to sink in a definite concentration of a wetting agent in water at a definite temperature. Tests are made at various concentrations

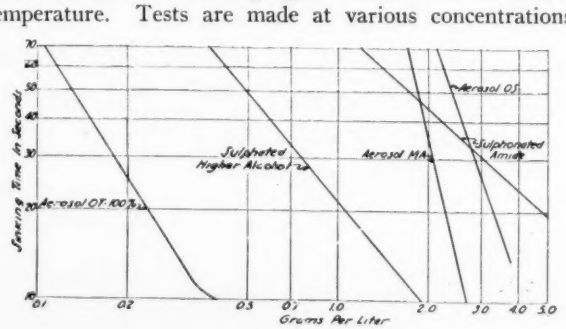

FIG. 1

of the wetting agent; the data are then recorded on log log paper as shown in Fig. 1.

From the data one can determine the concentration of wetting agents necessary to give a definite sinking time. If two materials, when used in the same concentration, give the same sinking time, they are of equal wetting power at that particular concentration. From their cost, one can determine their comparative money value.

The Draves and Clarkson sinking time method[5] is as follows. A 500-cc. graduate is filled with water, and another is filled with a dilute solution of a wetting agent. Cut the skein of yarn and in the middle of it fasten a 3-gram hook, which in turn is fastened by means of a piece of thread ¾ inch long to a 40-gram weight. When the skein is immersed in the water, the thread between the hook and the weight remains taut by virtue of the fact that the air in the fiber is not displaced by the water, due to the fact that the water has a high surface tension and will not wet the fiber which has a natural wax coating. If we place a like skein in the solution of the wetting agent, we will see that within a few seconds, the wetting agent solution wets the fiber, displacing the air, and the skein sinks.

We previously showed that wetting agents are composed of two portions, one, water-like in nature, and one oil-like in nature. The characteristics of the material, and therefore the suitability for a particular application will depend upon the "balance" of the two portions and their respective positions in the molecule. For example, the wetting power of various types of such compounds is shown in Fig. 1.

From this figure it is readily seen that the **Deceresol** OT-100% is by far the most powerful wetting agent of the group. In other words, considerably less of the material is required to give a definite sinking time than is required of the other materials examined. The structure of these respective materials is shown in Fig. 2.

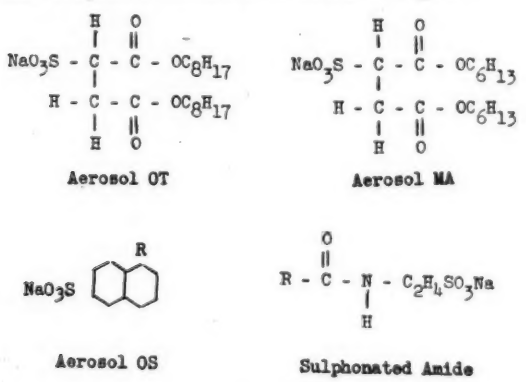

FIG. 2

We note that in the case of **Deceresol** OT, which is an ester of a sulfonated dicarboxylic acid, the polar or water-solubilizing group is approximately in the middle of a branded chain. In the case of the sulfated higher alcohol and the sulfonated amide, the polar or water-soluble group is at the end of a long nonpolar group. When these materials are dissolved in water, a definite number of molecules will be required to completely cover the surface of the water and also the interface between the solution and another surface. In the case of the sulfated higher alcohols and the sulfonated amide, the molecules can pack very closely together and a relatively large number will be required, because the molecules are relatively long, but small in diameter. In the case, however, of the ester of the sulfonated dicarboxylic acid, only a relatively few number of molecules will be required to cover the surface or an interface, inasmuch as the molecule when oriented, is relatively short, but considerably greater in area. This difference in molecular structure has an important bearing on the relative efficiency of these materials as detergents, as we shall see later.

SOLUBILITY AND MOLECULAR STRUCTURE

In addition to wetting power, the solubility of wetting agents is likewise considerably influenced by the structure and balance of the molecule (see Fig. 3).

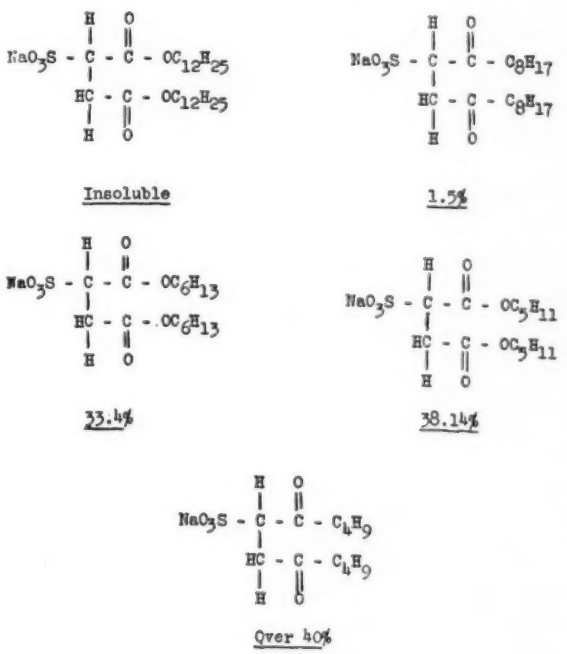

FIG. 3
Relation of "Balance" to Solubility (21 deg. C.)

In the case of the dilauryl ester of the sulfonated dibasic acid, the product is practically insoluble at room temperature. However, as we reduce the length of the polar chains, the solubility is increased and we note that the dioctyl ester is soluble to the extent of approximately 1.5 per cent and that as we reduce the length of the polar chain still further, the solubility is further increased, although not so markedly. However, in doing so, we

adversely affect the wetting power in ordinary water. For example, the dibutyl ester of the sulfonated dicarboxylic acid has no wetting power in ordinary water at a concentration of 1 per cent.

On the other hand, a considerable difference in wetting characteristics is noted in Fig. 4 when these materials are used in solutions of electrolytes.

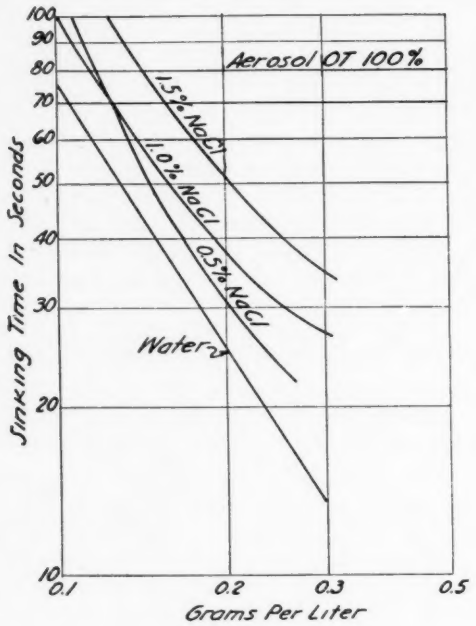

FIG. 4

This shows the effect of a salt solution upon the dioctyl ester. Notice that relatively low concentrations of salt decrease the wetting power of this material. However, when we examine the dihexyl ester in sodium chloride solution, we note that its wetting power in up to 5 per cent salt is considerably greater than its wetting power in ordinary water as shown in Fig. 5.

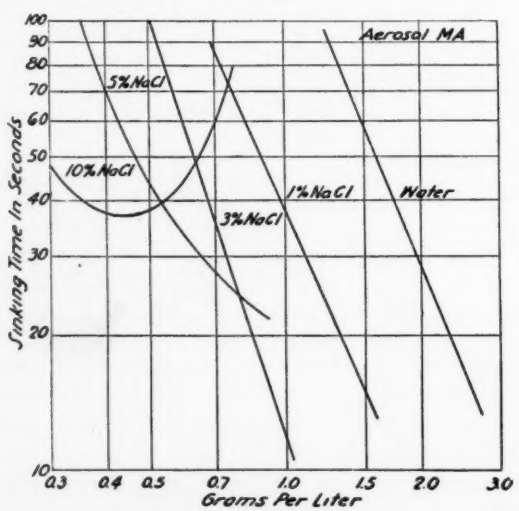

FIG. 5

In the case of the dibutyl ester, which you will recall has no wetting power in ordinary water at 1 per cent concentration, considerable wetting power is exhibited in 20 per cent sodium sulfate solution, and in fact very closely approximates that of the dihexyl ester when used in ordinary water as shown in Fig. 6.

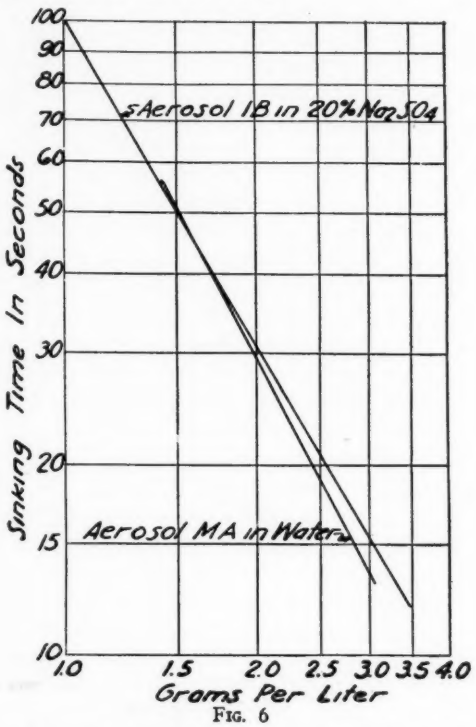

FIG. 6

If on the other hand, the concentration of the electrolyte is too high, the wetting agent will be actually salted out of solution. The quantity of electrolyte necessary to cause salting out depends upon the electrolyte itself and also upon the particular wetting agent and upon its concentration in the solution.

In view of the foregoing, we can state that generally, as the molecular weight of the nonpolar portion is increased, the solubility in water and in electrolyte solutions is decreased. As the molecular weight of the nonpolar portion is decreased, and providing the material has sufficient solubility, the wetting power is usually greater in electrolyte solutions than in pure water. It is thus apparent that wetting agents must be very carefully balanced and that the proper one must be selected for each particular application.

FOAMING

Another property of wetting agents and surface active compounds which is influenced by structure is that of foaming. The fundamental condition for the formation of a froth requires that there be a difference of concentration of the dissolved substance in the surface layer as compared to the concentration of the substance in the bulk of the solution. Figure 7 illustrates a cross-section of a bubble[6].

(Continued on page 18)

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Meeting, South Central Section, Read House, Chattanooga, Tenn., February 8, 1941.

Annual Meeting and Convention, Carolina Hotel, Pinehurst, N. C., Oct. 31, Nov. 1, 1941.

THE EVALUATION OF WATER-RESISTING TEXTILE FINISHES*

GEORGE A. SLOWINSKE**

THE A. A. T. C. C. Committee on the Waterproofness of Fabrics is undertaking an extensive survey of standards for water-resisting fabrics and methods for their evaluation. This paper describes testing methods which the author, a member of that Committee, is offering for consideration.

Water-resisting finishes are not new. There are scores of commercial products and processes available to render fabrics water-resisting. Nearly every retail clothing establishment carries garments treated to make them waterproof, water-resistant, or water-repellent. Magazines and newspapers regularly carry various advertisements extolling the merits of garments treated by some particular process. Practically every textile finishing mill applies such proofing processes, and, as a consequence, is faced with the problem of measuring the quality of its output of treated fabric.

Unfortunately, only limited progress has been made in the development of procedures suitable for measuring the resistance of textiles to water. The literature describes scores of procedures and instruments. But none of them are accepted as standards. In fact, most of the so-called "standard" tests are not the ones actually used by those engaged in the commercial application and exploitation of water-resisting textile finishes. Spotting tests, spray tests, running water tests, immersion tests, penetration tests, and hydrostatic pressure tests all are being used today in the industry. Consequently, confusion reigns. The whole problem is further complicated by a lack of practical or acceptable definitions of the terms used to describe the properties of the treated textiles which the different tests are intended to measure. Everyone has at one time or another heard of such seemingly unrelated terms as water-resistant, water-repellent, waterproof, stainproof, showerproof and rainproof.

GENERAL PROPERTIES OF WATER-RESISTING FINISHES

This paper is not concerned with the value of different treatments, nor with the terms used in describing them. It is concerned with measuring them. In order to accomplish this purpose it is necessary, however, to accept or agree on certain broad definitions. Back in 1924 there appeared a set of definitions which probably covers all of the present day water-resisting finishes. Pearson[1] offered the following:

"Waterproof means: Impervious to water, and air-resistant.

Water-resistant means: Resistant to water and porous to air."

Waterproof fabrics, according to the foregoing definition, include coated or filled fabrics, such as tar and resin-coated tarpaulins and rubberized textiles. The class also can be broadened to include, as a marginal case, heavy fabrics, such as ducks and awnings, which are not coated, but which must meet commercial requirements for the resistance to the passage of water under hydrostatic or mechanical pressure. Water-resistant fabrics would include fabrics containing water-resistant yarns, but which are porous and allow the passage of water under slight pressure. This class of fabrics covers the various water-resistant fabrics widely used today for men's and women's clothing. The term water-repellent might well be substituted for the term water-resistant, since the textile industry and the consuming public are more familiar with the former, though less accurate, term. Water-repellent fabrics then would include the fabrics treated with the one-bath, wax-type emulsions listed as "Water Repellents" under the section entitled "Textile Chemical Specialties" in the 1939 Year Book of the American Association of Textile Chemists and Colorists.[2] Also, under the same definition would fall the new durable type repellents recently introduced.[3]

It is believed that acceptance of the foregoing broad definitions would make possible a simplification of the problem of measuring and evaluating water-resisting finishes. It would make possible acceptance of procedures outlined by Scott in 1938.[4] Scott listed the following as inter-dependent requirements of modern textiles designed to resist the wetting action of water:

"1. Strong resistance to water under some pressure.

2. Moderate resistance to penetration by falling water, such as rain.

3. Resistance to actual wetting by water."

GENERAL TESTING PROCEDURES VARIOUSLY USED IN THE TRADE

The various procedures used in the trade to measure the three properties of water-resisting finishes listed by Scott

*Presented at Symposium on Evaluation of the Properties of Finished Textiles, Annual Meeting, New York, N. Y., October 19, 1940. This paper was also presented at a meeting of the Piedmont Section, November 2, 1940.

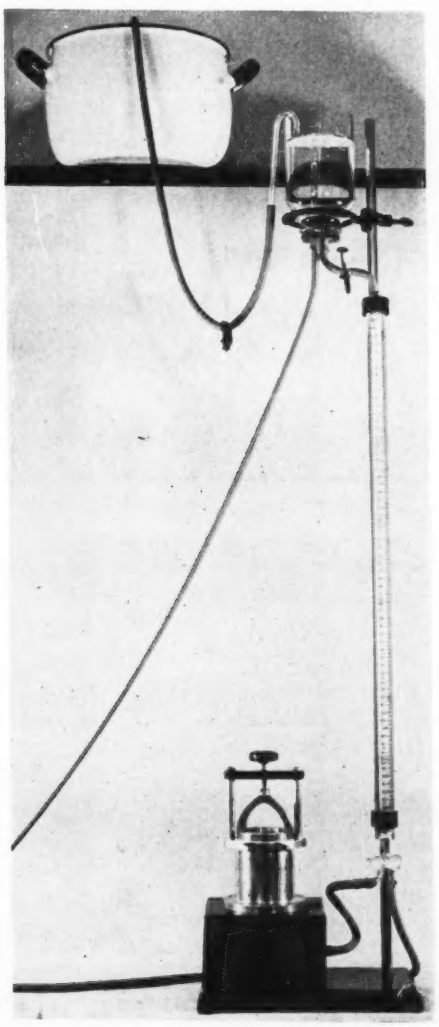
**Fine Chemicals Division, Technical Laboratory, E. I. du Pont de Nemours & Co., Inc.

likewise can be placed in three groups as follows:

1. Tests which measure the hydrostatic pressure required to cause "breakdown" of a fabric, and tests which measure leakage through a fabric under a fixed hydrostatic pressure, such as bag tests, box tests and funnel tests.
2. Surface repellency tests which measure surface wetting and penetration under the influence of falling water, such as spray tests, dropping tests and faucet tests.
3. Absorption tests which measure the absorption of water by a fabric when immersed or manipulated under water.

Hydrostatic pressure tests were probably the first used in the trade, since the first types of water-resisting fabrics produced were waterproof fabrics, or coated and filled fabrics. The two tests at present accepted as tentative standards by the American Association of Textile Chemists and Colorists, and described in its Year Book[5], are both hydrostatic pressure tests. One is the widely known, but little used, "Box Test," which also is specified in certain Federal Specifications.[6] The other is a commercial tester. Various other makes of this second instrument are available on the market. Surface-repellency tests are probably the most commonly used in the textile industry at the present time, although they have not been as well standardized as hydrostatic pressure tests. Absorption tests are not yet widely used, but it is believed that they will be used extensively in the future.

Fig. 1—Hydrostatic Pressure Tester—Complete Assembly



THREE PROPOSED SIMPLIFIED TESTERS

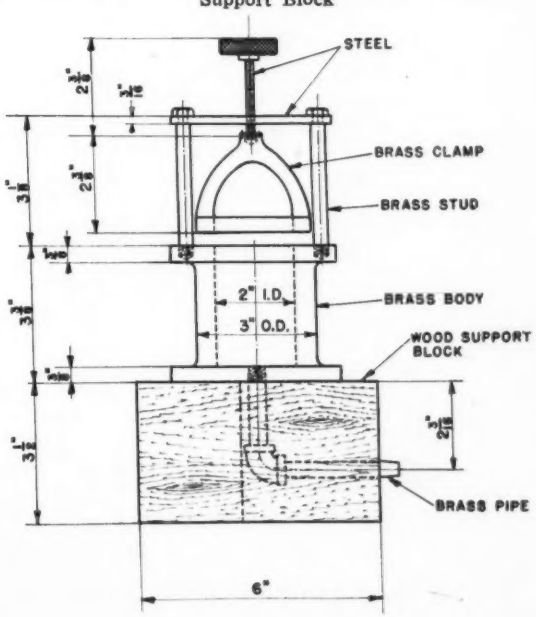
The foregoing discussions illustrate the premise of this paper that water-resisting textiles possess three distinct properties, which require three distinct tests for their evaluation. Actually, the wide variety of procedures used at the present time fall into three groups, but little attention has been paid to the fact that all three types are necessary. In nearly every case where an individual test is employed, it is used indiscriminately for all purposes on all types of fabrics.

For the past five years this author has used three simple testers to evaluate the different properties of water-resisting finishes. They have been standardized in the Du Pont laboratories, and at present are being used almost daily. They are:

1. A Hydrostatic Pressure Tester.
2. A Spray Tester.
3. An Immersion Tester.

The structural details of the instruments themselves are illustrated by the following three photographs of the complete assemblies and the three sketches of the important features.

Fig. 2—Hydrostatic Pressure Tester—Details of Holder and Support Block



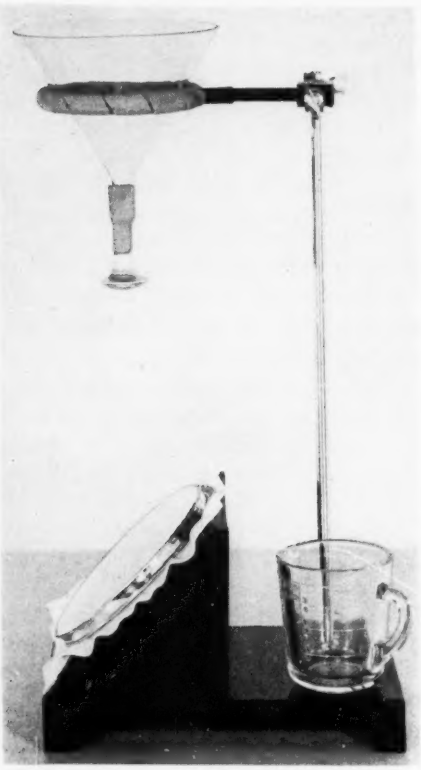


Fig. 3—Spray Tester—Complete Assembly

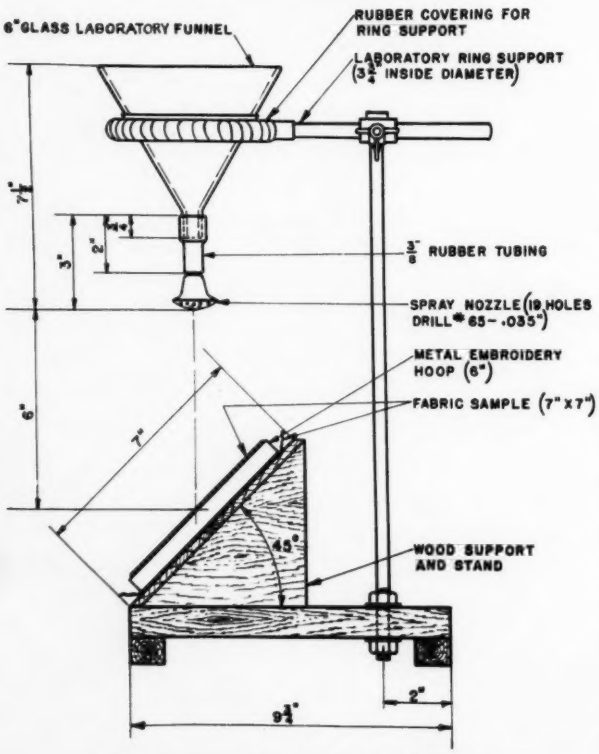


Fig. 4—Spray Tester—Structural Details

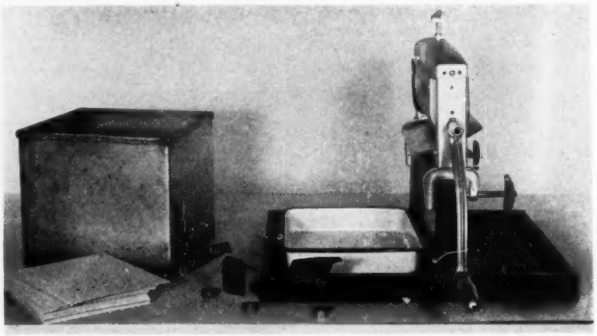


Fig. 5—Immersion Tester—Complete Assembly

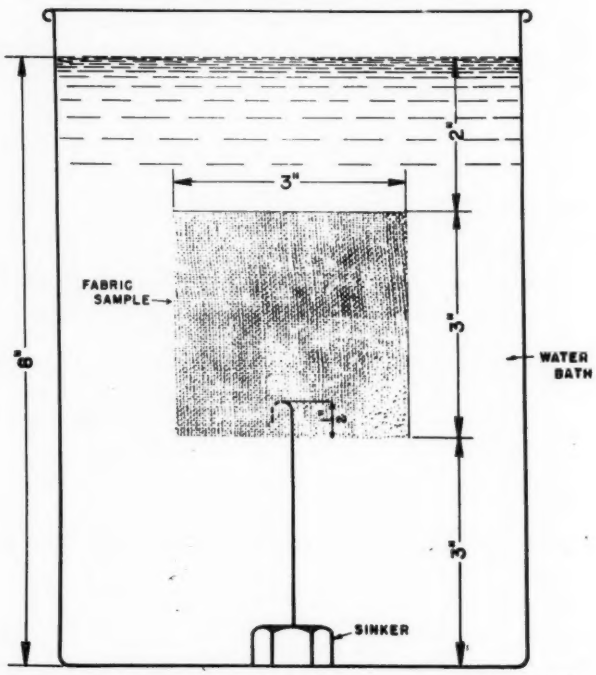


Fig. 6—Immersion Tester—Details of Immersion Tank

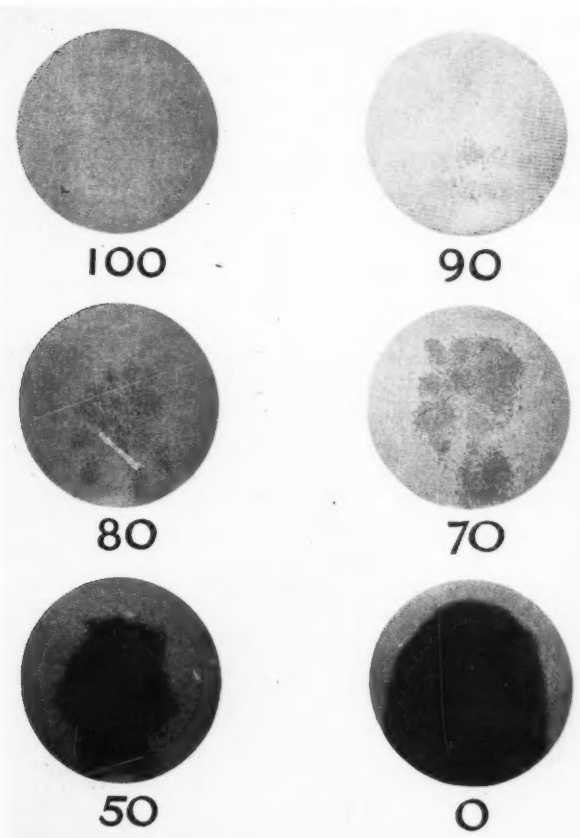
Details of the standardized testing procedures are given at the end of this paper.

The Hydrostatic Pressure Tester illustrated here is essentially the same in principle of operation as the commercial instrument, described and illustrated on pages 211-213 of the 1939 Year Book of the American Association of Textile Chemists and Colorists.[5] The sample holder of the tester is a reproduction of the holder developed by the Imperial Chemical Industries in England.[7] In carrying out the test, a sample of the fabric is clamped in the holder of the tester and the head is raised at a rate of one centimeter per second with water at a temperature of 80 ± 1° F. A reading is taken of the head required to force three drops of water through the fabric at three different points. Drops of water or leakages which occur at the circle of contact of the fabric with the holder are disregarded. The procedure of taking a reading of the

height required to force breakdown of the fabric at three different points eliminates or minimizes the possibility of error introduced by a non-uniformity in fabric structure. It is noted that the present tentative standard procedure of the American Association of Textile Chemists and Colorists specifies that the reading be taken "when the first drop of water appears on the fabric."[5] A study by Wenzel[8] in 1936 showed definitely the unreliability of "first drop" measurements in hydrostatic pressure tests.

The Spray Tester measures the resistance to surface wetting under conditions simulating those of rain. It was developed in the Du Pont laboratories, and first demonstrated by this author at a public announcement of a new type water repellent in New York City during 1938.[9] It is the instrument briefly described and illustrated in the December 23, 1938, issue of the Canadian Textile Journal.[10] The Rating Chart illustrated in that journal issue is the same as the present Rating Chart except that the numerical rating system has been improved. Both the design of the tester and the testing procedure are much simpler than those described by Cook and Zaparanick,[11] and Stiegler and Hood.[12] Approximately one hundred of the Spray Tester instruments have been made in the last two years and approximately eighty are being used at various points in the industry. In carrying out the test, a 250 cubic centimeter volume of water at 80 ± 1° F. is poured from a cup into the funnel of the tester and allowed to spray onto a taut fabric sample held in a holder at an angle of 45 degrees. At the end of the spraying period, the hoop holding the fabric is tapped in a controlled manner to remove loosely adhering drops of water. The fabric then is rated or compared visually with a standard chart where "100" represents maximum repellency and "0" represents no repellency (complete wetting and penetration). Intermediate stages or degrees of wetting are represented by intermediate numbers, with "50" representing complete surface wetting, but no wetting through the fabric. Drops of water which go through a light, porous fabric, such as a voile, but which do not actually wet through the yarns of the fabric, are disregarded. The photograph shown in Fig. 7 is a reproduction of the Standard Spray Tester Rating Chart.

Fig. 7—Spray Tester Rating Chart



The Immersion Tester measures the resistance of the fibers in a fabric to the absorption and retention of water. The assembly and test procedure were developed in the Du Pont laboratories and referred to in a previous paper by this author in 1939.[3] In carrying out the test, a weighed sample of fabric is immersed for 20 minutes under water at 80 ± 1° F. under controlled conditions, removed from the water, placed between two sheets of standard blotting paper to form a "sandwich" which is squeezed through a wringer to remove loosely adhering water, and then re-weighed. The increase in weight is calculated as per cent absorption, based on the original air-dry weight of the fabric sample.

GENERAL UTILITY OF THE THREE PROPOSED TESTERS

The following table shows data obtained with the three instruments on twelve representative fabrics of cotton, linen, viscose process rayon, cellulose acetate rayon, cuprammonium rayon, silk and wool. Data on both un-

TABLE I
Hydrostatic, Spray and Immersion Tester Data on Fabrics Treated with a Durable Water Repellent

	Hydrostatic Pressure Tester Reading—Cm.		*Spray Tester Rating*		*Immersion Tester Absorption—%*	
	Untreated	*Treated*	*Untreated*	*Treated*	*Untreated*	*Treated*
Cotton voile ..	0	2*	0	100	50	19
Cotton broadcloth ..	0	31	0	100	71	21
Cotton corduroy	0	14	0	100	88	16
Cotton gabardine	0	31	0	100	68	19
Cotton twill ..	10	33	0	100	57	19
Cotton duck ..	28	55	50	100	21	14
Linen sheeting	0	8	0	90	67	26
Viscose rayon crepe	0	13	0	90	83	49
Acetate rayon taffeta	0	15	0	100	39	19
Cuprammonium rayon dress .	0	15	0	100	80	18
Silk lining ...	0	33	0	100	72	27
Wool melton .	14	28	70	100	99	13

*Value too low to measure accurately.

treated and treated samples are given. The treated samples were processed in the laboratory with a durable type water repellent.[3]

The foregoing data in Table I show that waterproof and water-resistant or water-repellent fabrics on the market today possess different properties which no single test can be expected to measure. Hydrostatic pressure, spray, and immersion tests all are necessary to completely evaluate the wide variety of fabrics intended to resist water. For the same reason, no single test would ever be suitable in measuring all of the properties of a dyed textile. A dyed fabric possesses properties, such as fastness to washing, light, and bleeding, which require different procedures to evaluate.

Part of the confusion existing in the trade today is a result of an attempt to use a single procedure to evaluate all types of proofed fabrics. A particular test is devised and standardized. It then is used in rating all types of fabrics, even though the results obtained with it on certain fabrics may not be dependent on the properties of those fabrics which determine their quality. A case in point is the hydrostatic pressure test. It was developed originally to rate the coated and heavily filled fabrics which formerly constituted the entire class of proofed fabrics. When light, water-resistant or water-repellent fabrics were introduced, the same test was used in rating them, even though it was not adapted for the purpose. The data in Table I show that a light, open mesh fabric, such as a voile, can be rendered highly water-resistant or repellent by treatment with a modern type agent. However, such a treated voile is not a waterproofed fabric, according to the definition of Pearson,[1] referred to earlier in this paper. It is open and porous, and has little resistance to the passage of water under pressure. Consequently, a hydrostatic pressure test has no value on such a fabric. In the same way, the data in Table I show that a spray test, or an immersion test, when used alone, will not serve to adequately rate all types of treated fabrics. The ratings obtained with the Spray Tester on the untreated and treated wool melton differ by only 30 points. The absorption figure obtained with the Immersion Tester on the untreated duck is not very markedly different from that on the treated duck.

It is believed, in general, that the Hydrostatic Pressure Tester should be restricted to the evaluation of waterproof fabrics, or partially waterproofed fabrics which must meet requirements for resistance to the passage of water under pressure. The Spray and Immersion Testers should be restricted to the evaluation of water-resistant or repellent fabrics.

It is fully realized that the three instruments described in this paper may not be entirely suitable, in their present forms, for general use. It is realized that certain procedures in the tests, such as the construction of the spray nozzle of the Spray Tester, and the wringer squeezing procedure for the Immersion Tester, require improvement or standardization. However, it is believed that the three testers in their present forms may furnish a basis for the development of improved models. It is for this reason that they are offered for consideration. All of them are easy to run and require no elaborate equipment. All three of them are simple in design and can be constructed readily with a minimum of expense. This is especially true of the Spray and Immersion Testers, which are constructed mainly with standard laboratory and household equipment. Consequently, the testers can be used under a wide variety of conditions. The majority of the better devices described in the literature are too complicated or require too elaborate equipment to permit their general use. The three simple testers described here are intended primarily for use in control laboratories of chemical manufacturers, finishing mills and commercial testing establishments. They are not intended to supersede or replace the more precise equipment available for special work. In this connection, valuable work for the A.A.T.C.C. Committee on the Waterproofness of Fabrics is being done at the Massachusetts Institute of Technology under the direction of E. R. Schwarz, a member of the Committee. The work involves studies of the fundamental factors involved in water resistance, and studies of instruments capable of giving precise measurements.[13]

GENERAL ACCURACY AND PRECISION OF THE THREE PROPOSED TESTERS

The general accuracy of hydrostatic pressure testers, such as the tester described in this paper, has been thoroughly reported in the literature. The following tables show the effects of varying the spray height and water temperature in the Spray Test (Tables II and III), the sensitiveness of the Immersion Test in evaluating fabrics varying in water-resistance (Table IV), and the effects of varying the time of immersion, immersion depth, wringer pressure and water temperature in the Immersion Test (Tables V and VI).

TABLE II
Effects of Variation in Spray Height in Spray Test

Treating Agent and Fabric	*Spray Tester Rating with Indicated Spray Heights**			
	3 Inches	*6 Inches*	*12 Inches*	*24 Inches*
Durable type repellent—cotton poplin	100	100	100	100
One-bath, wax-aluminum salt repellent — cotton broadcloth	90+	90	70	70—

*Vertical distance from bottom of spray nozzle to fabric.

TABLE III
Effects of Variation in Water Temperature in Spray Test

Treating Agent and Fabric	*Spray Tester Rating with Water at Indicated Temperatures**					
	60° *F.*	80° *F.*	100° *F.*	120° *F.*	140° *F.*	160° *F.*
Durable type repellent—cotton poplin	100	100	100	80	80	70
One-bath, wax-aluminum salt repellent—cotton broadcloth ..	100	90	80	70	50	50

*Temperature of water on leaving spray nozzle.

TABLE IV
Immersion Tester Data on Fabrics Treated with Varying Concentrations of Repellent*

Per Cent Repellent in Treating Bath	Per Cent Absorption in Test			
	Cotton Gabardine	Viscose Process Rayon Crepe	Cellulose Acetate Rayon Taffeta	Wool Suiting
0	56	71	36	86
0.5	47	54	35	43
1.0	32	50	25	31
2.0	23	48	24	19
3.0	22	48	21	18
4.0	22	47	20	17

*One-bath, wax-aluminum salt repellent.

TABLE V
Effects of Variation in Time, Immersion Depth and Wringer Pressure in Immersion Test

Immersion Time—Minutes	Average Water Head Above Sample—Inches*	Wringer Pressure	% Absorption on Water-Repellent Cotton Gabardine**
10	3.5	Standard	22
20	3.5	Standard	23.5
30	3.5	Standard	24
20	2.5	Standard	23.5
20	4.5	Standard	24
20	3.5	1/3 of Standard	23.5

*Distance from surface of water to mid-point of test sample.
**Treated with one-bath, wax-aluminum salt repellent.

TABLE VI
Effects of Temperature Variation in Immersion Test

Treating Agent on Cotton Bunting	Per Cent Absorption in Test at Indicated Temperatures					
	40° F.	80° F.	120° F.	160° F.	200° F.	Boil 212° F.
Durable type repellent	18	18	18	24	54	54
One - bath, wax-aluminum salt repellent	21	23	47	58	62	62
None	—	65	—	—	—	64

Table II shows that the spray height in the Spray Test can be varied within wide limits without altering the rating of a highly water-resistant fabric, but that the rating of a less well proofed fabric varies indirectly with the spray height. This feature of the Spray Tester does not affect its value in rating present day water-resistant or repellent finishes, since it was found that forty-five different, commercially processed cotton fabrics tested during 1939 and 1940 gave an average rating of 80 with a spray height of 6 inches. The treating agents were various one-bath, wax-aluminum salt repellents.

Table III shows that the water temperature exerts a marked effect on the Spray Tester rating of a treated fabric. This is especially true with the wax-emulsion treated fabric examined. Table VI shows the same type of data obtained with the Immersion Tester. This point of temperature control has been studied extensively by Stiegler and Hood.[12]

Table IV shows Immersion Tester data obtained on representative cotton, viscose process rayon, cellulose acetate rayon and wool fabrics proofed with a series of concentrations of a wax-emulsion type agent. It should be noted that the minimum absorption obtained on the viscose process rayon is 47 per cent, while the minimum absorptions obtained on the cotton, cellulose acetate rayon and wool fabrics are 22 per cent, 20 per cent and 17 per cent respectively. Other studies not reported here have shown that this is a characteristic behavior of viscose process rayon treated with wax-type repellents or with durable-type repellents investigated to date. In addition, it has been found that the Immersion Tester described in this article often gives erratic results on viscose process rayon fabric. As a consequence, it is not recommended for use on such material. The test is, however, especially valuable in showing small differences in different water-resistant cotton and wool fabrics. In this connection, an average absorption of 23 per cent was obtained on forty-five representative, commercially processed cotton fabrics obtained from various sources during 1939 and 1940. The treating agents were various one-bath, wax-aluminum salt repellents.

Table V shows that the immersion time, immersion height, and wringer pressure for the Immersion Tester can be varied within reasonable limits without seriously affecting the absorption. The treated fabric used in the tests was a well proofed fabric. It is probable that the variables studied would have a greater effect on the absorption of a less well proofed fabric.

DETAILED PROCEDURES FOR USE WITH THE THREE PROPOSED TESTERS

Hydrostatic Pressure Tester

Cut out a 3 x 3 inch sample of the fabric to be tested and clamp it firmly in the holder of the tester by screwing down the clamp. The cutting of the sample, and the operation of clamping it in the holder should be carried out carefully so as not to cause distortion of the fabric. Adjust the water temperature in the overhead storage tank to 80±1° F. Fill up the constant level device with water from the storage tank and adjust the screw clamp on the rubber tube leading from the storage tank so as to maintain a constant overflow in the constant level device. Remove the pinch clamp from the tube leading from the constant level device to the glass hydrostatic pressure cylinder. This rubber tube leading to the glass hydrostatic pressure cylinder should have at its lower end a nozzle calibrated to raise the level of the water in the pressure cylinder at a rate of one centimeter per second. This nozzle may be made from a small section of soft glass tubing drawn out in a gas flame.

Observe the height reached in the glass pressure cylinder at the instant that drops of water appear at three separate points on the upper side of the fabric in the holder. Disregard drops of water or leakages which occur at the circle of contact of the fabric with the holder.

Run the test on three samples of the fabric and average the individual results.

Drain the water from the holder after each three individual determinations in order to avoid possible errors introduced by contamination of the water by the test fabrics.

Spray Tester

Cut out a 7 x 7 inch sample of the fabric to be tested. Fasten it securely in a six-inch metal embroidery hoop. A convenient type is the circular kind obtained at "Dime" stores.

Support the hoop on the stand of the tester so that the fabric is uppermost. In the case of twills, gabardines, piques or fabrics of similar ribbed construction, the test sample should be placed on the stand in such a way that the ribs are diagonal to the flow of water running off the sample.

Pour 250 cc. of water at 80 ± 1° F. from a cup or other suitable container into the funnel of the tester, and allow it to spray onto the fabric sample. The duration of spraying is usually 25-30 seconds. The spray nozzle is a kind obtainable at "Dime" stores and is illustrated fully in the accompanying sketch of the assembly.

At the completion of the spraying period hold one edge of the hoop and tap the opposite edge once against a solid object (the fabric on the hoop should face this object), then rotate the hoop and tap once more at the point previously held.

Rate the test fabric by comparing the wetted or spotted pattern with the Rating Chart, or rate it in an equivalent manner as follows:

100—No sticking, spotting, or wetting of upper surface.
90—Slight random sticking or spotting of upper surface.
80—Wetting of upper surface at points where water sprays impinged.
70—Partial wetting of whole of upper surface subjected to spray pattern.
50—Complete wetting of whole of upper surface subjected to spray pattern.
0—Complete wetting of whole of upper surface subjected to spray pattern and complete penetration or wetting through to lower surface.

NOTE: Drops of water which go through a light, porous fabric, such as a voile, but which do not actually wet through the yarns of the fabric, should be disregarded in rating it.

Immersion Tester

Cut out a 3 x 3 inch sample of the fabric to be tested. Weigh the sample to the nearest 5 milligrams (a 3 x 3 inch sample of most textile fabrics will usually weigh less than 5 grams in the air-dried condition).

Fasten a sinker to one side of the sample.

Drop the sample (with the attached sinker) into the immersion tank containing water at 80 ± 1° F. The sinker should be heavy enough to sink to the bottom of the container, and the depth of water in the container should be adjusted so that the test fabric will be submerged under an average hydrostatic head of 3.5 inches. This latter condition will be met if (a) the depth of water is 8 inches, (b) the sinker measures 3.5 inches from the lower end to the hook at the top, and (c) the hook on the sinker is attached to the center of one side of the 3 x 3 inch test fabric at a point 0.5 inch in from the edge. This is illustrated in the accompanying sketch of the immersion tank assembly.

Allow the test fabric to remain submerged for 20 minutes.

At the end of the immersion period remove the fabric from the water and remove the attached sinker.

Quickly place the fabric between two 7 x 8 inch pieces of dry blotting paper to form a sandwich and squeeze through a wringer.* The blotting paper should be "Buff Sterling Blotting Paper, 7 inches by 8 inches" of the Standard Paper Manufacturing Company, Richmond, Virginia, or a type equivalent in rate of absorbency and total absorbency. The rolls of the wringer should be kept under a uniform pressure. The wringer should be a household type equipped with soft rubber squeeze rolls.

Quickly re-weigh the test fabric.

Divide the increase in weight of the test fabric by the original air-dry weight and multiply the result by 100 to obtain the per cent water absorbed. Run the test on three samples of the fabric and average the individual results.

REFERENCES

[1]Pearson, H. P. "Waterproofing of Textile Fabrics," p. 8, The Chemical Catalogue Company, 1924.
[2a]"1939 Year Book of the American Association of Textile Chemists and Colorists," Vol. 16, p. 490, Howes Publishing Company, Inc., 1939.
[3]Slowinske, G. A., Am. Dyestuff Rptr., *28*, P647-650 (1939).
[4]Scott, W. M., Am. Dyestuff Rptr., *27*, 479-482 (1938).
[6a]"1939 Year Book of the American Association of Textile Chemists and Colorists," Vol. 16, p. 211-214, Howes Publishing Company, Inc., 1939.
[6]"Federal Specifications for Textiles: General Specifications, Test Methods, CCC-T-191a," April 23, 1939, U. S. Government Printing Office (For sale by the Supt. of Documents, Washington, D. C.).
[7]"Auxiliary Products Pamphlet No. 19, 'Waxol W,'" Imperial Chemical Industries, Ltd., London, England.
[8]Wenzel, R. N., Am. Dyestuff Rptr., *25*, 598-601 (1936).
[9]Press Release of E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, December 13, 1938.
[10]Canadian Textile Journal, *55*, 36 (1938).
[11]Cook, A. A., and Zaparanick J., Am. Dyestuff Rptr., *26*, 323-325 (1937).
[12]Stiegler, H. W. and Hood, J. M., Am. Dyestuff Rptr., *28*, P285-287 (1939).
[13a]"1939 Year Book of the American Association of Textile Chemists and Colorists," Vol. 16, p. 107-108, Howes Publishing Company, Inc., 1939.

DISCUSSION

Mr. Wood: Why was 80° F. taken as the standard for your test?

Mr. Slowinske: In the laboratory where the testers were developed 80° F. was an average of winter and summer temperature,—no scientific reason whatever.

Mr. Wood: But for rain-repellent fabric that would be rather high, wouldn't it?

Mr. Slowinske: Naturally you wouldn't get any rainfall at 80° F., that is true, but a treated fabric which would show up well with water at 80° F. would show up well with water at lower temperatures, so you are really in-

*In the case of napped fabrics of all fibers, and in the case of all fabrics of 100 per cent wool (napped or not napped), the test sample should be passed once through the wringer without blotters, and then passed again through the same wringer with blotters.

creasing the severity of the test by using a higher temperature. I believe the A.S.T.M. has adopted 70°, or tentatively adopted it.

President Draves: What is the diameter of the holes in the spray nozzle? As you buy it you have to rebore them, don't you?

Mr. Slowinske: No, that spray nozzle is purchased in a ten-cent store. However, we have measured the diameter of the holes, and determined a drill size for the holes. It is a No. 65 drill, which is .035 inch in diameter. I have one of the nozzles here. We have actually tested about two or three hundred of them, and we find that they will all give the same rating on the same fabric. There possibly are slight variations in construction but they are not enough to influence the results obtainable in the test.

Mr. York: In your charts showing the drop in water-repellency due to raising the temperature and also raising the height of the spray, you started in with a fabric that was originally 100. Do you think the results would have been changed if the original rating was, say, 90 or 80, on a durable type repellent?

Mr. Slowinske: No. The type of product used there is not affected by temperature as much as the wax emulsion type. We have obtained the same type of data with the immersion tester on the same two fabrics. Those types which react in some way or combine with the textiles are less affected by an increase in the water temperature than the ordinary wax types. What happens in the case of a wax type is that the wax melts and the repellency is destroyed.

Mr. York: Don't you think that while 100 is a good rating there are what you might almost call different degrees of 100? Some of them would shed the water much better than others, and they might stand a higher temperature or greater distance.

Mr. Slowinske: That is true. But we still think that the test could be modified by increasing the volume of water instead of increasing the height. During the past two years we had occasion to check up on forty-five different cotton fabrics treated with various types of repellents, different wax emulsions and different durable type repellents. The average spray test rating was 80. We all hope that the repellents on the market will improve to such an extent that we will have to increase the severity of the test, but we think that can be done using this model.

Mr. Borghetty: Do you suggest the use of the hydrostatic pressure test being restricted to fabrics really waterproof or coated? Wouldn't you rather extend that classification to a piece of very tightly woven fabric such as an overcoat? Because you would certainly admit that a voile which might have an excellent water-repellency would be absolutely valueless as a fabric to be worn, because it would let the water go through the holes of the fabric.

Mr. Slowinske: That is true. I would class the tightly woven fabrics as partially waterproof. They are partially waterproof because of their construction.

Mr. Borghetty: Some are so partially waterproof that they are absolutely no good. A voile might have the threads waterproof, in other words, let us say, 50 per cent is waterproof, the other 50 per cent is holes. That fabric might have a certain repellency when you drop the spray in one direction, but if you put it on horizontally it just lets the water go through like a sieve.

Mr. Slowinske: Yes, but I believe the best way to tackle the whole problem is to design tests which measure the water resistance or water repellency or waterproofness, or whatever term you want to use, of the yarn. You have other ways of defining or describing a fabric, such as yarn count, weave, weight.

Does that answer your question, or are we still at odds?

Mr. Borghetty: I just wanted to raise it. You see, you made the remark that you would suggest the restriction of the hydrostatic pressure test to waterproof fabrics. I didn't think it was quite right. I would rather extend it to waterproof fabrics and to very tightly woven fabrics, which still breathe but are not coated.

Mr. Slowinske: I will agree there. I would class such fabrics as partially waterproof when they are treated.

Mr. Borghetty: A very tightly woven fabric which has excellent waterproofing quality would really be a waterproof fabric rather than a water-repellent fabric.

Prof. Macormac: In the immersion test did you run it through a wringer with a blotter on each side, top and bottom?

Mr. Slowinske: Yes.

Prof. Macormac: And then you weighed the blotter and the fabric together?

Mr. Slowinske: No. We removed the fabric from the blotters and weighed the fabric separately.

Prof. Macormac: I see. In other words, the idea of the blotters there was to get off surface moisture?

Mr. Slowinske: Yes.

Prof. Macormac: And then you weighed the fabric by itself?

Mr. Slowinske: Separately.

Member: Have you any data on the pressure of the squeeze rolls?

Mr. Slowinske: Yes, we have. We found that you can vary the wringer pressure over wide limits without changing the absorption of a treated fabric. Could we have slide C?

(Slide) In this test we varied the immersion time, the immersion depth and the wringer pressure. As to the point that you raised, you notice it is the same treated fabric, actually treated with a wax type repellent. With the standard control pressure, at all different heights, we got absorptions of between 22 and 24, and here we deliberately cut down the pressure on the squeeze rolls to one-third of the standard, and the reading went up to 23.5. That is all.

President Draves: How did you estimate that third

pressure?

Mr. Slowinske: The pressure on the wringer rolls in that case was controlled by means of lever arms and weights on the end of the lever arms.

Mr. Kapelsohn: Have you found any difference in ratings by either of the three tests where the fabrics were conditioned under different degrees of humidity?

Mr. Slowinske: We haven't attempted to condition fabrics before testing except in one way. That is, after proofing a fabric it should be conditioned in a normal atmosphere, or in the room, at least twenty-four hours before testing, in order to get a good value or a good measurement of its water resistance. The reason for that, of course, is that when a fabric is proofed the last operation in the proofing process is a drying operation. The fabric then is bone dry. It should be given a chance to absorb its normal moisture content before rating.

Mr. Kapelsohn: Have you found actual variations or irregularities in the ratings when you don't give it a chance to condition?

Mr. Slowinske: Yes.

Mr. Kapelsohn: I imagine you don't get reproducible results if you don't allow that to happen, is that it?

Mr. Slowinske: You will have to wait twenty-four hours or overnight in order to get a reproducible result. I have personally run across a number of instances in finishing mills when fabric processed in the afternoon and rated as poor or fair, tested next morning satisfactorily.

Member: Do you take the ends of the fabric into account in your immersion tests, as far as absorption goes?

Mr. Slowinske: The cut ends?

Member: You are allowed twelve inches of cut end. Wouldn't that vary some with the type of fabric and its thickness and so forth?

Mr. Slowinske: We have carried out tests to determine the effect of the cut edges and we find with the usual commercial water repellents the fact that the edges are cut does not influence the result obtainable in the test. We ran the immersion test on samples of wool fabric which were treated as three by three inch samples, and when we compared them the results we obtained on those samples approximated the results which we obtained on larger samples of the same fabric treated with the same repellent. We found no relative differences in immersion test absorption.

Member: That would depend a good deal on the degree of penetration of the water repellent you had.

Mr. Slowinske: Yes. But you can make a blanket statement that all of the commercial water repellents do penetrate beneath the surface of the fabric.

Mr. Souther: Is it rather difficult to grade the cloth in the spray test? Isn't it rather difficult to grade it 70 or 80? I understand you grade it by the amount of water left on the cloth in the spray test.

Mr. Slowinske: Yes. We rate it by making a visual comparison of the sticking, spotting, or wetting on the surface of the fabric. Actually, you can describe those ratings. You notice we only have five ratings. 100 is no surface wetting, no sticking or spotting; 90 is slight variant sticking, one or two spots on the fabric. If you get definite evidence of wetting at the points where the water sprays impinge you have an 80 rating. If you get wetting beyond the points where the water sprays impinge you have a 70 rating. But if the whole upper surface of the fabric is wetted it is 50. If you get penetration through to the back you approach 0 in rating. We only have those few classifications. We don't have any difficulty placing any individual fabric in one of those classifications. We would run into trouble if we doubled the classification.

Mr. Borghetty: In judging the permanency of the water-repellent finish what criterion do you go by? I asked the question because I notice the tendency is to boil the fabric one hour. Do you consider that severe, or does that correspond to just one washing?

Mr. Slowinske: Boiling for one hour is a severe test if you have mechanical agitation at the same time. The test that we use in the du Pont laboratories is carried out in a rotary wash wheel, starting at the boil, and running for forty-five minutes. At the end of the laundering operation the temperature falls to about 160, so we have an average temperature, roughly, of 180. And there we have mechanical agitation. But I believe it would be a more severe test in which you boiled the fabric in a pot of soap and soda ash, along with mechanical agitation.

MEMBERSHIP APPLICATIONS

Associate

Milton C. Beard—General Manager, Foster-Heaton Co., Elizabeth, N. J.

John C. Cook—Business Manager, *Cotton,* Atlanta, Ga.

Howerton Gowen—Chemical Distributor, Charlotte, N. C.

Milton J. Greene—Salesman, De Paul Chemical Co., New York, N. Y.

Ben Gruenwald—Salesman, De Paul Chemical Co., New York, N. Y.

T. V. Hart—Director of Sales Service Lab., Penick & Ford, Cedar Rapids, Iowa.

A. J. Hettesheimer—Salesman, du Pont Co., Atlanta, Ga.

Thomas P. Key—Owner, Mutual Laboratories, Philadelphia, Pa.

William D. Livingston—Salesman, American Aniline Products, Inc., Charlotte, N. C.

George F. Ogan—L. C. Chase & Co., New York, N. Y.

Mrs. A. E. Sampson—Beverly, Mass.

Student

Wm. S. Bartenbach—Philadelphia Textile School. Sponsor: E. C. Bertolet.

Gorden S. Cohen—Philadelphia Textile School. Sponsor: E. C. Bertolet.

Dario Echavarria—Philadelphia Textile School. Sponsor: E. C. Bertolet.

(Concluded on page P16)

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the American Dyestuff Reporter any vacancies which may occur in their business.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

NOTICE TO EMPLOYERS

● ***Complete personal histories and employment records of the following applicants are on file at the office of the American Dyestuff Reporter.*** ●

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

A-1

Education—Graduate textile chemistry and dyeing course, Lowell Textile Institute, 1932. Special course in colloid chemistry at M.I.T.

Experience—Library work in spare time while attending school; five years as assistant chemist with knitting mill, duties consisting of testing and grading silk, testing of oils, soaps, dyes, finishes and other chemicals, making up specifications for various lines of hosiery and checking finished product, keeping a check on production costs, control of waste and irregulars, checking competing products and carrying on research to improve product and reduce costs. Woman; age 30; references.

A-B-8

Education—Graduate Chemist.

Experience—Print superintendent, colorist; eleven years' experience in all types of fabrics, specializing on rayon; 8 years' dyestuff laboratory and demonstrating. Excellent references; age 37; married.

A-B-9

Education—Textile School Graduate.

Experience—Executive and sales type of textile chemist and colorist desires position in sales, contact, promotional or supervisory work. Factory, laboratory, office and purchasing experience. Good correspondent. Good personality. Accustomed to assuming responsibility and exercising initiative. 21 years' experience in the textile, chemical and dye industries. Opportunity most important.

Age 43; American; married.

A-B-10

Education—1 year of textile chemistry, day course, Philadelphia Textile School; also business course.

Experience—3 years as apprentice in weaving mill in Germany, office and stock room, general clerical work, practice in all departments of cotton manufacture, dyeing, bleaching and finishing of cotton-rayon mixtures, piece and package processing; several mos. in laboratory of German dyestuff manufacturer, dyestuffs and assistants and their application, vat and naphthol dyeing.

Age 20; will go anywhere in U. S.

A-B-11

Education: Graduate chemist. Correspond and converse German, some French.

Experience: 3 years dyer; 4 years dyestuff testing, trouble-shooting, purchasing; 4 years demonstrating, consulting, and supervising for large dyestuff manufacturer. Thoroughly experienced on rayon, cotton, silk, acetates, printing, vats. Fullest references as to character and ability. Seeks position as technician, consultant, or superintendent with reliable dyestuff sales organization or dyehouse. Age 33, married.

A-B-12

Education—Philadelphia Textile School (Evening), Chemistry and Dyeing, Quantitative and Qualitative Analysis.

Experience—Two years in yarn office, making wool stock blends. Last 6 years in dyehouse, 4 years as kettle hand, 2 years in piece dye work. Worked on yarn, raw stock and piece goods; has been dyer on union piece goods, cotton, rayon and wool, leaving wool white; also worked on all wool fabrics and woolen cross dyes; also considerable laboratory experience doing laboratory dyeings and extraction work. Seeks position as dyer or laboratory technician. Age 30; married; references.

A-B-13

Education—B.S., Chemical Engineering, Oregon State College, 1926.

Experience—First experience in dry cleaning plant; few months as sampling and control chemist with potash and chemical company; two years in dry cleaning plant, all phases of work; few months on routine and special analyses, plant problems, special studies and research for gas and electric company; 10 years teaching experience on textile chemistry, dyeing and textile testing covering all general and special courses in this field; consultant work with various mills. Seeks position in textile chemistry or dyeing.

Age 37; married; will go anywhere; references.

A-B-14

Education—Graduate of New Bedford Textile School, chemistry and dyeing course.

Experience—Two years in dyeing filament rayon skeins; seven years general laboratory work in large print works; four years overseer of package dyeing of cotton and spun rayon with all types of colors. Plant liquidating; must find other employment

Age 34; married; references.

A-B-15

Education—Graduate chemistry, dyeing and finishing course, New Bedford Textile School, 1940.

Experience—None. Seeks position in dyeing or finishing departments or in testing (chemical, physical, microscopical).

Age 27; single; references.

A-B-16

Education—Graduate, 1932, 3 year evening course in chemistry and dyeing, Philadelphia Textile School.

Experience—Chemist and colorist, 14 years, matching shades on all types of materials with most classes of colors. Also checking and testing dyes, finishes, soaps, oils, and making special color cards and samples.

Age 31; married, references.

A-B-C-4

Education—Educated abroad.

Experience—Twenty years experience in the textile field as bleacher, dyer, finisher and chemist. 16 years in charge of dyestuff laboratory of large dyeing plant, 4 years as chief chemist with large bleachery. Has tested dyestuffs, and chemicals used in the textile field and has manufactured soaps and textile specialties. Has handled all textile fibers; bleaching, printing, dyeing and finishing same. Has done pigment and lacquer printing, waterproofing and fireproofing. Reason for leaving last position was due to business conditions. Age 41; married.

A-B-C-9

Education—Lowell Textile Institute; chemistry, dyeing and textile finishing.

Experience—Twelve years head dyer in hosiery mills. Dyeing all types of fibers and in combination. Knowledge of all dye applications. Matching and formula making. Charge of every department in a hosiery mill except fixing machinery. Has done jigg work on cottons and rayons. Desires position in hosiery, or in any field. Would like to work as an assistant to head dyer in a woolen or rayon mill. Age 42; married. Will go anywhere in the United States.

A-B-C-10

Education—Graduate New Bedford Textile School, 1940.

Seeks position connected with chemistry, dyeing or finishing.

A-B-C-D-1

Education—Lowell Textile Institute, Bachelor of Textile Chemistry; Lowell Textile Institute (Evenings), 2 years D. C. Electricity; 2 years A. C. Electricity.

Experience—Six years as chemist and assistant dyer with a large organization. Specialized in dyeing, finishing, bleaching and drying of woolens, worsteds, cottons, rayons and unions in the piece. Some sales experience. Desires position as chemist, dyer, finisher, bleacher or sales. Age 30; American citizen; Married.

A-B-D-2

Education—Evening courses, chemistry and dyeing, Philadelphia Textile School.

Experience—Eighteen years varied experience as dyer and chemist. Dyeing experience on cotton, wool, shoddy, raw stock, union piece goods, mohair, rayons and alpacca.

Age 37; married; references.

A-B-C-E-1

Education—3 years Chemical Engineer major in college; honor graduate Philadelphia Textile School, chemistry and dyeing course.

Experience—Ten years experience as chemist, colorist, technical director in bleaching, dyeing and finishing of cottons and rayons. Also one year's similar experience in South America. Instructor of textiles and textile chemistry in state vocational school, 2 years. Married; age 32; references; will go anywhere.

A-B-C-F-2

Education—Graduate, Lowell Textile Institute, 1908.

Experience—Over 30 years experience as chemist, color mixer and matcher, foreman printer, foreman dyer on all types of fibers and colors, and finisher. Experience installing complete dyeing and finishing departments. Experience as manager of dyeing and finishing companies. Experience in New York market: interviews with converters, obtaining orders, new customers, settling claims, etc.

Age 51; married, will go anywhere; references.

A-B-D-1

Education—Special courses in general chemistry.

Experience—Twenty-nine years' experience in application and standardization laboratories of various dyestuff manufacturers. Well versed in the application of dyestuffs to different textile fibers, i.e., wool, cotton, rayon, silk, acetate rayon and unions, using direct, acid, diazo, sulfur, acetate rayon, chrome and after-treated direct dyestuffs. Six months' actual dye house experience on jigs, open boxes, padders, bleaching and mercerizing. Experience demonstrating sulfur and direct colors at various mills. Seeks position as textile colorist in application laboratory and demonstrator. Age 46; single; references.

B-6

Education—Graduate New Bedford Textile School; also post graduate work in advanced microscopy and rayon testing.

Experience—Five weeks in color shop of print works. Wants position in anything associated with textile chemistry, dyeing, finishing and testing. Single; age 21; references.

B-7

Education—Evening course in chemistry and dyeing at Philadelphia Textile School. Evening course in chemistry at Drexel Institute.

Experience—Started as second hand in dyeworks, then two years as head dyer on women's and children's hosiery. One year as head dyer with other dye works on all types of women's hosiery including Bemberg, rayon and cotton combinations.

Age 26; married; will go anywhere in U. S.; references.

B-8

Experience—20 years' experience with printing companies. Experience as colorist on basics, chromes, Indigosols, vats, rapid fasts, naphthols, Rapidogens and Aridyes. Seeks position as colorist and shader.

Age 49; married; references.

B-9

Education—Graduate of German textile school.

Experience—Twenty-seven years' experience abroad and in this country as chemist, colorist and dyer on cotton, rayon, wool, half-wool, half-silk and silk with various types of dyes and machines. Experience as trouble shooter.

Age 43; married; references.

B-C-1

Education—Two year night course in chemistry, Rhode Island School of Design.

Experience—Nineteen years' experience in printing and finishing plants, in practically every department. Has had direct charge of color shop and practical experience in both peroxide and chemic bleach. Also has had experience as assistant superintendent and superintendent of printing and finishing cotton and rayon piece goods and as company manager in finishing plant.

Age 38; married; references.

B-D-1

Education—General education in England. Chemistry and Dyeing Courses at Huddersfield Technical School.

Experience—Has been a superintendent of dyeing since 1911. Has had experience in worsted mills, hosiery mills and woolen mills. Congenial, sober and reliable. Married; references; age 53.

F-1

Education—Two years high school; 6 years evening engineering school; 1 year evening textile school; 1 year industrial management; course in accounting.

Experience—Ten years in an executive capacity in full fashioned hosiery manufacturing business. Familiar with entire manufacturing procedure, finishing dept., dyehouse and office. Specialized in finishing dept. and has good eye for color, finish and quality. Had responsibility of all orders going through mill, stock, grey goods and traffic. Five months in New York sales office. Gets along well with people and contact with employees and customers has always been satisfactory. Previous to hosiery experience was in a mechanical business for 17 years.

43 years of age; single, in good health; will go anywhere.

MEMBERSHIP APPLICATIONS

(Concluded from page P14)

E. A. Gleadall—Philadelphia Textile School. Sponsor: E. C. Bertolet.

M. Leonard Katz—Philadelphia Textile School. Sponsor: E. C. Bertolet.

John R. Keim—Philadelphia Textile School. Sponsor: E. C. Bertolet.

Arnold L. Roher—Philadelphia Textile School. Sponsor: E. C. Bertolet.

E. P. F. Stewart—Philadelphia Textile School. Sponsor: E. C. Bertolet.

Stanley M. Suchecki—Philadelphia Textile School. Sponsor: E. C. Bertolet.

Thomas Porter Caldwell—North Carolina State College. Sponsor: A. H. Grimshaw.

Yesun Coln Ding—North Carolina State College. Sponsor: A. H. Grimshaw.

Lane C. Drye—North Carolina State College. Sponsor: A. H. Grimshaw.

George W. Funderburk, Jr.—North Carolina State College. Sponsor: A. H. Grimshaw.

Robert J. Granger—North Carolina State College. Sponsor: A. H. Grimshaw.

Clarence F. Gregory — North Carolina State College. Sponsor: A. H. Grimshaw.

James Lawrence Lee — North Carolina State College. Sponsor: A. H. Grimshaw.

Samuel M. Littlejohn — North Carolina State College. Sponsor: A. H. Grimshaw.

G. R. Sedberry, Jr.—North Carolina State College. Sponsor: A. H. Grimshaw.

John E. DeKalb—Lowell Textile Institute. Sponsor: L. A. Olney.

George S. Higginbottom—Lowell Textile Institute. Sponsor: L. A. Olney.

Sanford Lee Hornung—Lowell Textile Institute. Sponsor: L. A. Olney.

Walter W. Platt—Lowell Textile Institute. Sponsor: L. A. Olney.

Stuart F. Shafter—Lowell Textile Institute. Sponsor: L. A. Olney.

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LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
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DEPRECIATION NEEDS CHECKING

DURING the past ten years, many new problems have arisen to vex business One is a tremendous increase in the cost of government which is reflected in higher taxes, more kinds of taxes, entirely new types of taxes. Another is a tendency throughout the world for governments to oppose free private enterprise. This opposition has been carried to the extreme in such countries as Russia, Italy and Germany. It contributed to the downfall of France. It has become more and more apparent even in the United States. A third is the steady increase in the investment which must be made in any production plant while, at the same time, there is shortening of the work week by law. The list could be continued. It all sums up to industry being given less and less freedom of action while the costs of doing business steadily increase.

Industry is faced with two general kinds of taxes. One is the property or assets tax. The other is the income tax, the corporation income, the excess profits tax and the like. Industry is taxed on its capital whether it realizes any net income or not and if profits are made these, also, are taxed. This means that assets and profits records need to be checked as closely as possible to make certain of the highest possible degree of accuracy.

In the chemical and dyestuffs industry, research has been bringing about great changes which have had a direct influence upon the rate of obsolescence of machinery and equipment. Under no conditions, if any technological progress is being made, is it possible to determine by formula the rate of depreciation and obsolescence. Obsolescence is the rate of getting out of date and that is determined by progress made in research and progress made not only in the industry in which the machinery and equipment is being used but in other industries as well. Research gives rise to new processes and new materials. It gives rise to new and better machinery and equipment and there is no way to determine, in advance, what the rate of technological progress will be. It is more difficult now than ever before because, as far as application is concerned, much may depend upon the government attitude. If all new inventions or discoveries resulting from research are applied to industry at once, the result as far as obsolescence is concerned is quite different from what they are if, due to one crisis or another or the theory of some bureau head, the government prevents immediate application.

Both in regard to progress due to research and in regard to the freedom of applying research gained knowledge to industry, the immediate future is unpredictable with any degree of accuracy. Therefore, no obsolescence formula can determine, except by chance, what the actual obsolesence will be over a period of time, be that period a year or longer.

The rate of wearing out, of course, depends upon use and care. A given production plant can determine its own policy in regard to maintenance of its machinery and equipment. That policy may be one which requires that every piece of equipment in the plant be maintained in perfect condition or it may not. The policy adopted depends a good deal upon the management.

Under present conditions no concern can determine what it will produce and how much. Any chemical or dyestuffs plant may be required by the government, for example, to turn more and more of its facilities to the production of what is required for warfare. This may range all the way from dyes needed to dye cloth for uniforms, blankets and other textiles used by the army, the navy and the airforce, to turning out war chemicals of one kind or another. It may even be called upon to install machinery and equipment which will not be needed in peace time.

Such conditions as these make the figuring of total depreciation by formula dangerous. There is but one way to determine depreciation in the present situation and that is to make actual appraisals of every physical asset, every machine, every piece of equipment and to make these appraisals with future possible use in mind. In no other way can the actual net profits be determined with accuracy and if those net profits are not figured accurately, they may be figured too high with the result that higher taxes, both on assets and on profits are paid than are due the government. If the book depreciation is lower than the actual depreciation, it is obvious the value shown for machines and equipment is too high. If the full depreciation is not charged against gross income, the net profit also is given at a figure which is higher than the actual net.

Among the objections raised against such physical appraisals are the cost, that the government will not accept the figures for tax purposes and the difficulty at arriving at the real values even in case of actual appraisals. The answer to such objections is that if the company is to continue as a going concern it must know its costs and its profits and it cannot know them unless it knows, with the highest possible degree of accuracy, what its depreciation really is. Unless that depreciation is known and met out of gross income, there is always danger that overlooked depreciation will dissipate the capital value of the concern.

Much of the differences between the government and the tax payers has arisen from the use of depreciation formulae. There is good reason to believe that close agreement can be arrived at in regard to appraisal methods and values. There is a vast difference between considering each machine and each piece of equipment by itself and averaging the depreciation of all of these in a percentage figure. The actual depreciation and obsolescence of any two manufacturing plants may not be the same. A lot, among other things, depends upon the policy in regard to replacing old machines and equipment with new. The depreciation and obsolescence of any two machines or two pieces of equipment in the same plant may not be exactly the same. The government is inclined to expect the user to place depreciation too high when doing so means a reduction in the total tax bill. The user is inclined to expect the government to place depreciation too low when doing so means collecting more taxes.

Any depreciation formula which makes use of an average is likely to mean that certain machines and certain pieces of equipment are written off the books before their use ceases. In such cases, the government is likely to demand that these continue to be taxed. This may mean that higher taxes have to be paid than would have been the case if depreciation was figured on each machine and each piece of equipment separately. If the depreciation is figured in this manner, it is only one more step to make actual appraisals every year.

In the case of a new plant which is built exclusively for war production and which may become valueless from the production point of view, present laws permit of writing off the total capital cost in five years. However, any producing plant may be called upon to do war work which requires certain machines and equipment that cannot be used after peace time conditions return. To speed up war production, these plants will have to turn to war work as much as possible and they will have to buy and install those machines and that equipment which are needed for the special work. Under an annual appraisal system, it should be possible to obtain the consent of the government to depreciate those special machines and equipment, those which will not be used on any other work, at the rate of 20 per cent a year. Obviously, this could not be done unless each machine and each piece of equipment was considered as a unit. Averages cannot be depended upon.

There is a tendency for the government to enter into business to a greater and greater degree. Should the government decide to take over the ownership of any producing plant, its valuation and the price it would pay can be expected to be based upon an appraisal showing the present physical valuation. If it has been the practice of the company to make appraisals every year and if the books show the depreciation upon the basis of these valuations, then what the government finally pays should agree closely if not exactly with the book values. On the other hand, if there is failure to check book values against actual values every year there is always the possibility that the book values will be too high. Not enough depreciation has been charged up. Had the error resulted in the owners receiving more revenue from the business than they should, the end result would be about the same whether or not the book values were correct. However, in the present situation what would happen is that the government would receive higher taxes than were due it. A very considerable part of that difference between the real value of the physical assets and the higher values carried on the books would have been paid the government in taxes. The result is a serious net loss to the owners.

Should present world conditions continue for a considerable period, the possibilities of the government taking over and operating private industry increase in seriousness. It should not be overlooked that the government did take over and operate the railroads during the last war. During the past ten years the government has entered into business to a greater degree than ever before. Should this country become actively engaged in war, it is not going to be an easy matter to prevent the government from taking over and operating more and more private enterprises. Regardless of whether it takes over the ownership or just the operation, it is highly important that there be an accurate record of the physical assets. Otherwise, it is difficult for the owners to secure full compensation from the government.

Wetting Agents—

(Continued from page 4)

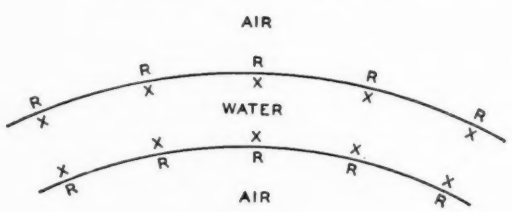

FIG. 7
Foam Formation

R denotes the oil-soluble portion and *X* denotes the polar or water-solubilizing group. Such a film is relatively stable, since it is elastic. If the tension in the film is increased by increasing the area, the concentration of the

wetting agent, or surface active compound is reduced, and the surface tension is increased, which balances the increased tension. If the area is reduced, reducing the tension in the film, the wetting agent concentration is increased and the surface tension will be decreased to balance the reduced tension. If a material is too soluble, or too insoluble, it will not produce a copious foam. A 0.2 per cent concentration of the dioctyl ester of sulfonated dicarboxylic acid forms more foam and a more stable foam than a 0.2 per cent concentration of the dibutyl ester of sulfonated dicarboxylic acid. Likewise, a 0.2 per cent solution of a sulfonated higher alcohol, produces more of a froth and a more stable froth than either of the other two materials. This is in line with our experience that in general, detergent-type surface active products are better foamers than wetting agent types.

DETERGENCY

Still another property considerably affected by structure of polar-nonpolar or surface active compounds is that of detergency. In studying soap as well as synthetic organic detergents, we note that they are possessed of one common similarity. That is, a straight chain hydrocarbon on the end of which is located the polar or water-solubilizing group. This series of compounds differs from the more truly wetting agent types in that the latter have the polar group located nearer the middle of the chain. Typical of the synthetic organic detergents are such products as the sulfated higher alcohols, sulfonated amides, fatty acid ester sulfonates, sulfonated ethers, and the higher molecular weight alkyl aryl sulfonates. Close packing of the straight-chain type products is furthermore closely allied with their superior detergent properties compared to the branch-chain wetting agents. As we pointed out previously, however, the branch-chain types are far superior as wetting agents. This difference in detergent efficiency between a wetting agent-type compound and an organic synthetic detergent is demonstrated with pieces of wool cloth which have first been impregnated with a standard soil mixture of carbon-black and oils and subsequently washed in one case with 0.2 per cent of a wetting agent and in the other with a 0.2 per cent solution of a detergent-type surface active compound. You will note that the pieces washed with a sulfated higher alcohol are much lighter in color than the one washed with a true wetting agent type of material.

Detergent efficiency is influenced, not only by the type of organic detergent, but also upon the type of surface being cleaned, the type of soil to be removed, temperature, and furthermore, much depends upon the pH of the cleaning solution. Most soil carries a negative charge, and therefore, if it is at all possible, the surface from which the soil is to be removed should be made to assume the same charge as the soil, so that they will repel one another. As was shown by Neville[7], cellulose carries a negative charge in water. In the case of cellulose in water, the negative charge is more pronounced in the presence of alkali, and he was able to show that the higher the alkalinity, the more readily was the soil removed. In his experiments, carbon-black was used, this being typical of soils, inasmuch as it carries a negative charge. The addition of soap caused a considerable increase in detergent efficiency because (among other factors) the fabric assumed a more highly negatively charged condition than in the presence of the alkali alone. He also showed that the sulfated higher fatty alcohols, although fair detergents in themselves, are much more effective in the presence of alkali.

Wool and silk are quite dissimilar to cotton or other cellulosic materials, in that they are amphoteric in nature. That is to say, they may have a positive or a negative charge, depending upon the pH of the medium in which they are treated. As was shown by Sookne and Harris[8], it was found that wool carries a positive charge below a pH of approximately 4.5, and carries a negative charge above this pH. Silk carries a positive charge at a pH below approximately 3.7, whereas it carries a negative charge at a pH above this value. Such being the case, it can readily be seen why washing silk and wool with the usual anion type detergents in an acid medium is less efficient than washing these fabrics in a slightly alkaline medium.

CATIONIC SURFACE ACTIVE MATERIALS

So far, we have been dealing with "anion" wetting agents and surface active compounds. Anion surface active compounds have a surface active or nonpolar portion of the molecule which carries a negative charge. If a direct current is passed through an aqueous solution of such materials, the surface active portion of the molecule will migrate to the anode. In addition to the anionic-type materials, there is another class which, when dissolved in water and a direct current is passed through the solution, has a nonpolar group which deposits at the cathode or negative pole. Such products are termed "cationic." Representative materials of the latter group are primary and secondary amine acid salts, quatenary ammonium compounds, and sulfonium and phosphonium compounds (see Fig. 8).

If we mix anion and cation surface active materials together in proper proportions, we will obtain a precipitate because the two opposite charged nonpolar portions unite to form a high molecular weight oil-like compound which is so oil-like in nature that it is thrown out of solution.

This leads us to speculate as to what will happen when we attempt to use cation and anion materials for cleaning, dyeing, finishing, or other applications. First, let us consider detergency with regard to cation surface active compounds. In the case of cotton carrying a negative charge, we note that when a cation surface active material is used, the carbon-black is more firmly bound, than if plain water were used. In this case the nonpolar cation is attracted by both the carbon-black and the cellulose, binding the two together more firmly. Likewise, we note the effect of adding alkali to the solution containing the cation surface active compound. Contrary to the improved results in using an alkali with an anion detergent, the efficiency is not appreciably increased.

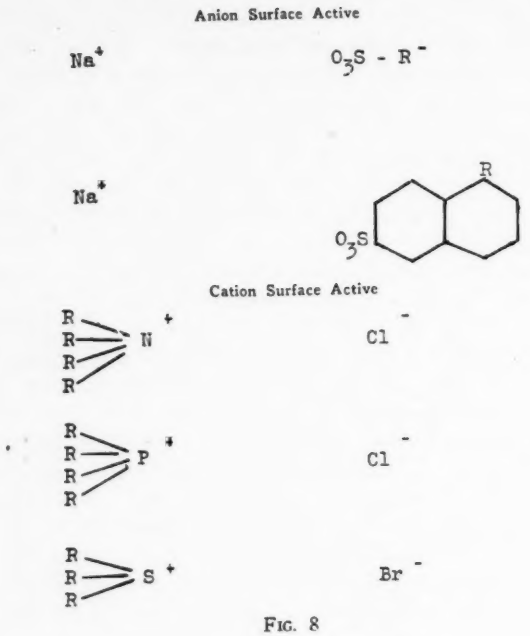

FIG. 8

It has been reported that cation surface active compounds have been found useful in scouring wool on the acid side[9]. These products are relatively new and no doubt many uses will be found for them.

Let us now consider wetting agents in relation to dyeing. Among the many dyes available, there are types which are known as acid and basic. Acid dyes are similar to anion surface active compounds in that the active portion—i.e., the color ion, carries a negative charge, whereas in the case of an anion surface active compound, the active portion likewise carries a negative charge. Upon adding an anion wetting agent to a solution of an acid dye, the solution remains clear.

Basic dyes are similar to cation surface active compounds, in that the active or color ion carries a positive charge, similar to the polar or surface active portion of a cation surface active compound carrying a positive charge. Upon adding a cation surface active compound to a solution of a basic dyestuff, the solution remains clear.

Now, if we add a solution of an acid dye to a solution of a basic dye, a precipitate will occur. The same occurs if we add a solution of a cation surface active compound to a solution of an acid dye, and likewise a precipitate will occur when we add a solution of an anion surface active compound to a solution of a basic dye.

It therefore is evident that care should be exercised in selecting the particular type of surface active compound to be used with a specific dyestuff. As was shown by Smith[10] anion wetting agents are of value in dyeing primarily because the fiber is wet rapidly with consequent rapid swelling of the fiber, allowing the dyestuff to penetrate more readily, whereby more rapid and level dyeing is obtained. This is shown by the following experiment where an ordinary butcher's wrapping paper is dipped in an acid dyestuff solution, and in the other the same solution containing an anion wetting agent. We immerse them for the same length of time, withdraw them and note that the solution containing the wetting agent produces stronger and more level dyeing.

Naturally, wetting agents find considerable application in the general industrial field. For example, they are used in agricultural sprays where they promote wetting of foliage. They find application in unpigmented surface coatings where they produce a better bond between the coating and the surface. They also find application in the treatment of oil wells with acid solutions. In emulsified lubricants and grinding emulsions, they serve the purpose of promoting more intimate contact between the lubricant and the surface, and furthermore accelerate the settling of foreign particles in the lubricating emulsion. In alkali detergent mixtures, they promote greater cleaning efficiency and in solvent degreasing mixtures, considerably improve solvent action. Considerable quantities are used in making glass-cleaning preparations, and much is used in the photographic industry. The dry cleaning industry uses these materials in dry cleaning solvents and in spotting mixtures and considerable quantities of both anion and cation types are being used in the manufacture of pigments. Wetting agents also find application in the electroplating of metals where, by their use, a more uniform deposit is obtained and they reduce the tendency of spotting in rinsing the plated articles.

So far, wetting agents have not found extensive application in the paper industry. However, they are being used for such applications as reworking broke stock, in which case the stock can be wet much more readily than if no wetting agent were used. Other applications are in dyeing operations, where more rapid and more level dyeing is obtained, in the sealing of cartons, for which purpose the wetting agents are very effective in wetting the tap, especially in cold weather. They are useful for wetting certain classes of pigments, which are ordinarily difficult to wet and have been found of value in paper towelling, for conditioning felts and for washing felts.

May I emphasize in conclusion, the importance in approaching the problem of using surface active materials, of first determining whether wetting, detergent or dispersing action is involved and then (after conditions have been established) selecting with care the product most suitable to the case at hand.

LITERATURE CITED

[1]Hauser, E. A., and Reynolds, H. H., *J. Chem. Ed.* 16, 392 (1939).

[2]Bannel, W. S., Byman, L., and Keyes, D. B., *Ind. Eng. Chem.* 32, No. 4, 532 (1939).

[3]Christmann, L. J., "Chemistry of the flotation process," American Cyanamid Co. Tech. Paper No. 17, 5, Nov., 1930 (out of print).

[4]Langmuir, I., *J. Am. Chem. Soc.* 39, 1848 (1917).

[5]Draves, C. J., *Am. Dyestuff Rept.* 28, 425 (1939).

[6]Christmann, L. J., "Chemistry of the flotation process," American Cyanamid Company, Tech. Paper No. 17, 4 (Nov., 1930).

[7]Neville, H. A., *Am. Dyestuff Rept.* 25, 267 (1936).

[8]Sookne, A. M., Harris, M., *Am. Dyestuff Rept.* 28, 412, 28, 593 (1939).

[9]Wakelin, J., *Textile Colorist*, 62, 159 (1940).

[10]Smith, J. E., *Ind. Eng. Chem.* 31, 40 (1939).

TRADE NOTES • NEW PRODUCTS

OBITUARY

FRANK C. BROADBENT

FRANK C. BROADBENT, the Geigy representative in upper New York State, Ohio and Michigan, died suddenly sometime between Tuesday, December 17th, and Wednesday, the 18th, in Elmira, New York.

Mr. Broadbent's passing closes a career of an entire lifetime in the dyeing and dyestuff fields. After some years as dyeing superintendent in various mills, he entered the Geigy organization on June 1, 1929, since which time his colorful personality and his vast technical knowledge made him one of the most beloved and respected men in the dyestuff industry.

He leaves a host of friends among consumers, colleagues and men in the dyestuff industry.

Mrs. Broadbent and a son, Warren, of Princeton University, survive.

IN MEMORIAM

JOSEPH F. X. HAROLD
January 3, 1940

HEAVEN is a more joyful place today, for Joe is there. With the goodly fellowship of the prophets, the noble army of martyrs and all the saintly hosts of the blessed, he will be singing songs of praise and of thanksgiving in a voice which will have lost none of the enthusiasm we knew but will have gained a ringing harmony befitting celestial anthems. For Joe possessed a depth of spirit and a clarity of faith only one of his imagination could have.

But if we know Joe, it will not be long until his gregarious spirit, freed at last from the agonies of a tortured body, will seek out the corner of heaven where broken friendships are knit up again. There he will find Egan presiding over a celestial round table. There Alcan Hirsch and Merritt Matthews will continue friendly, pointless arguments through eons of luncheons. There will be Charley Herty and Elwood Hendrick each topping his favorite potion. There will be O. P. Amend, and Parker McIlhiney, and Love and Lane, and many, many more. But the good God will have made places for them all. And Joe will come with his stubby cigar that will never be smoked out and put his battered straw hat under his chair. When he has said, "Hello, fellows," taken his seat and complained about the soup, then heaven for all that company will be a better, livelier place. Then for Joe, too, heaven will be complete.—Reprinted from *The Percolator*.

• GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York, N. Y., announces release of circulars describing the following products:—

Rapidogen Navy Blue FFR—said to produce particularly fine navies, brighter and redder than those obtainable with present brands such as Rapidogen Blue N. Rapidogen Navy Blue FFR is said to show good stability and to dissolve readily without the addition of solvents. It is stated that it develops more rapidly than other brands and couples completely during a short acid ageing. Circular G-210.

Palatine Fast Blue GGNA-CF—an acid dyestuff said to possess fastness properties which approach closely those of the Chrome Colors. It is stated that, due to its very level dyeing and fastness properties and its easy method of application, it is well suited for producing fast-to-wearing shades on the better grades of ladies' and men's wear. It can be used on piece goods and on yarns of all kinds, especially knitting, hosiery and carpet yarns, and further on loose wool and slubbing which is to be given a light fulling. It is suited also for producing fast shades on silk. It can be discharged to a good white with Rongalite C on either a wool or a silk ground. Circular G-211.

Amido Yellow EA-CF—an acid color said to possess very good level dyeing properties as well as very good light fastness. It is well suited for the dyeing of both piece goods and yarns. In combination with other fast to light and well leveling acid colors it finds extensive use in the production of mode shades on ladies' dress goods, draperies, upholstery and hats. It is best dyed according to the sulfuric acid method, showing, however, fairly good affinity from a neutral bath. It is suitable for use on materials which are subsequently rubberized. Circular G-208.

Benzoform Blue Green B A Conc.—a direct color recommended for the dyeing of cotton and, particularly, of rayon. When aftertreated with formaldehyde and acetic acid, in the usual manner for Benzoforms, it produces fairly bright, very bluish shades of green of comparatively good fastness to washing, to water and to perspiration. It is stated that the color is well suited for use on materials which require a degree of fastness to wet processing beyond that obtainable with the average direct color. It is dischargeable to a clear white with either a neutral or an alkaline Rongalite C paste. The addition of chrome to the formaldehyde bath affects neither the shade nor the fastness properties; the addition of copper sulfate produces somewhat bluer and duller shades and slightly impairs the light fastness. Circular G-209.

• NEW TYPES OF RESIN EMULSIONS

Three new types of "Methacrol" methacrylate resin emulsion finishing agents are announced by the Fine Chemicals Division of the Du Pont Company.

"Methacrol" BE—a stiffening and bodying agent that is compatible with polyvalent metal ions and with cationic surface active agents. It is therefore adapted to use in finishing operations where these materials are present in high concentrations. "Methacrol" BE is substantive to wool, silk, cotton, nylon, viscose process rayon and cellulose acetate rayon. It can be applied from a dilute bath by exhaustion. It is stated that the substantive property makes it particularly suitable for use on knit goods and fabrics that cannot be handled on a padder or quetsch. When used with "Zelan" A in a combination bath, it modifies the soft hand produced by the "Zelan."

"Methacrol" NH—a finish for nylon hose which is said to impart snag-resistance and a delustering finish. It is a stable milk-white fluid dispersion that is compatible with metallic ions, but not with soaps or other soaplike surface active agents. The finish is said to add body to the stockings to permit satisfactory packaging. It is durable to washing.

"Methacrol" SH—recommended by the manufacturers for use either alone or in combination with "Aridex" WR and/or "Aridex" WP (Pat.) on silk hosiery. It is said to have a very strong delustering effect on the fiber, being more active in this respect than "Methacrol" NH. When used with starch (or gelatin) and "Aridex," excellent water repellency and a good body are said to be obtained. It is stated that by varying the percentages of these materials, almost any desired hand can be produced.

• RETAINED BY PARENT'S MAGAZINE

The United States Testing Company, with branches in principal cities throughout the United States, has been retained by the Consumer Service Bureau of *Parents' Magazine* as technical adviser and to do the majority of its testing, according to an announcement made by Mrs. Barbara Daly Anderson, Director of the magazine's Consumer Service Bureau. The Bureau awards the Parents' Magazine Commendation Seal to products that it considers worthy of it, whether or not these products are advertised in Parents' Magazine. Parents' Magazine also maintains a small testing laboratory in its offices at 52 Vanderbilt Ave., New York.

• ANNUAL DINNER, CHEMICAL SECTION

John J. Toohy, Chairman of the Drug, Chemical and Allied Trades Section of the New York Board of Trade announced today that the 16th Annual Drug, Chemical and Allied Trades Dinner would be held on Thursday evening, March 13, 1941, at the Hotel Waldorf-Astoria, New York. The reception will begin, as usual, at 630 P.M.

He further announced the appointment of Rudolph F. Berls, of McKesson and Robbins, Inc., as Chairman of the Reception Committee, with Victor E. Williams, of Monsanto Chemical Company, acting as Vice Chairman. The Publicity Committee will be headed by Ira P. McNair, of McNair Dorland Company, with Thomas R. Farrell, of Drug and Cosmetic Industry, acting in the capacity of Vice Chairman.

"From the early interest evidenced," said Mr. Toohy, who is Sales Manager for E. R. Squibb & Sons, "we will undoubtedly have a capacity attendance again this year of about eighteen hundred persons. The office of the Section at 41 Park Row is already accepting reservations.

• JOINS FOOTE MINERAL

Otto Kessler, a chemical engineer, for many years with General Chemical Company, has become associated with the enlarged chemical division of the Foote Mineral Company, Philadelphia. He will devote most of his time to production problems of this growing division.

• MEETING, PHILADELPHIA ALUMNI

Continued and increased cooperation between U. S. Army Quartermaster officers and textile men in the New York market and at the mill was urged by I. Ruskin Schwartz, who is in charge of the New York office of the Philadelphia Quartermaster Depot, in an impromptu talk before the New York Club of Philadelphia Textile School, at a dinner meeting held Dec. 13th. Mr. Schwartz said, in part, "The Army needs its textiles quickly, it is true. It also wants to keep its standards up. But we are always glad to have your suggestions as to how the Army and the Quartermaster Corps can better cooperate with you men in industry, to the end that there can be a better understanding between these two factors in national defense."

Mr. Schwartz was introduced by Milton Schmidt, president of the group, who also presented the principal speaker of the evening, Richard S. Cox, assistant dean of the Philadelphia Textile School. Mr. Cox discussed informally a number of changes and improvements which have been or are being made at the school. He pointed out that considerable new machinery was being installed, including the Whitin cotton and spun-rayon equipment which was on display in the Ford exhibit at the World's Fair, the raw wool exhibit which was in the Australian building at the Fair, package dyeing machinery manufactured by Smith, Drum and Co. and by H. W. Butterworth and Sons Co., as well as other equipment. He also stated that improved lighting, seating, and other facilities are being installed as rapidly as possible.

Mr. Cox pointed out that the school's grading system is undergoing extensive revision, to bring it into line with those of other institutions of higher learning. He also stated the school is gathering together a textile library which it is hoped will be second to none, and asked the alumni of the school to donate as many books as possible from their private libraries. Alumni cooperation was also requested in the matter of supplying vocational guidance to prospective students, and in keeping authorities at the school posted on market trends which might have a bearing on the kind of training which should be given to students so as to best fit them to enter the industry upon graduation.

• JOINS RIVERSIDE AND DAN RIVER

P. E. Smith, a graduate of the North Carolina State College Textile School, has accepted a position as manager of bleaching and finishing at the Riverside and Dan River Cotton Mills, Inc., Danville, Virginia.

Until recently Mr. Smith was superintendent of bleaching and finishing at Marshall Field and Company, Spray, North Carolina.

• DU PONT RELEASES

Four new dyestuffs have been introduced by the Dyestuffs Division of the Du Pont Company. They are:

"Polyform" Blue RF — a formaldehyde-aftertreated direct color. Like the other members of the group, it is of particular interest as a ground shade on viscose process rayon which is to be subsequently discharged. It is slightly greener in shade than "Polyform" Blue 2RF (P.A.F.) and therefore better suited to the production of navies. When dyed on rayon, it is said to show very good fastness to washing at 160° F., light, perspiration and pressing.

"Diagen" Red Violet DR—a stabilized azoic printing color suitable for application to cotton. It produces reddish shades of violet which are said to possess good fastness to washing, power laundering with chlorine and hot pressing. Its light fastness is about equal to that of "Diagen" Bordeaux MR (Pat.). This dyestuff can be used with the latter product to produce bluer bordeaux shades.

"Sulfogene" Brilliant Green 4GX Conc.—a sulfur color which produces bright yellowish shades of green. It is similar in all its properties to the older type "Sulfogene" Brilliant Green 4GX except that it is much more soluble and is therefore better suited to use in circulating liquor type machines. This product is equally suitable for application to cotton rawstock, yarns or piece-goods, and because of its good fastness, it is particularly recommended by the manufacturers for washable fabrics such as denims and ginghams, as well as awnings and upholstery materials.

"Sulfogene" Brilliant Blue RCF—a sulfur color which possesses fastness properties similar to those of "Sulfogene" Brilliant Blue 3GCF. However, it produces redder shades of blue than the older type. It is recommended by the manufacturers for both cotton and rayon and is suitable for practically all types of machine dyeing as it levels and penetrates well. It is of interest for application on rawstock, yarns and piece-goods.

• TECHNICAL NOTES FROM FOREIGN SOURCES •

Dissociation of Ammonium Salts in Contact with Wool—Part 2

Goodall and Hullah—J. Soc. Dyers & Co., 56-217, *May,* 1940.—In a paper noted in these columns some months ago, Briggs and Goodall described the effects of boiling dilute solutions (0.033 N) of ammonium chloride, sulfate, formate, oxalate and acetate under conditions approximating to those of practical wool dyeing. In the present article this examination is extended to include several other ammonium salts, not necessarily those in technical use, but which are considered to be of fundamental importance to the general conception of the behavior of ammonium salts in contact with wool and to the theory of wool dyeing. This second group includes ammonium dihydrogen phosphate, diammonium hydrogen phosphate, ammonium monochloro-acetate, nitrate and sulfite-salts derived from a range of acids of widely varying dissociation constants.

From the experimental work here described and tabulated the authors find full confirmation of the conclusions

reached in Part 1 of the investigation—(a) that in the absence of wool, the amount of ammonia evolved in one-hour at 100° C. increased with a fall of dissociation constant of the acid from which the salt was derived, and (b) that the introduction of wool into the solution caused increased evolution of ammonia with salts derived from highly dissociated acids, but had a negligible effect on ammonia volatilization from salts derived from weakly dissociated acids. These conclusions are to be further extended in a later paper.

Finishing Woolen Fabrics by Electricity

R. G. M. C.—520-XX, May, 1940.—In a volume on finishing published some forty years ago, the suggestion was made that electricity might be employed in finishing certain types of flannel and light woolen fabrics. The unnamed author proposed to mount wooden rolls at each end of a wool sponging machine in such a manner that the cloth in open width could be found alternately from one to the other. Insulated iron guide bars were to be fixed before each roll and connected to the poles of a dynamo. The fabric, which formed the only connection between these bars, would carry no current while dry, but if dampened with dilute sulfuric acid proved to be a good conductor. As the material passed from one roll to the other it was thus subjected throughout to the action of the current, which resulted in the formation of a true pile ("duvet") on both faces of the goods, the electricity apparently causing individual fibers to rise from the threads. The fabric could then be freed from acid, dried and carefully brushed, the pile effect still being retained.

The author urged that this process merited further investigation, but there is no record that it was ever developed practically, and it is mentioned here simply as a curiosity from the past.

• BOOK REVIEWS •

Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists. *W. W. Skinner, Chairman Committee on Editing Methods of Analysis. Fifth edition,* 1940. *Published by the Association of Official Agricultural Chemists, P. O. Box* 540, *Benjamin Franklin Station, Washington, D. C.* 757 *pages. Price* $5.00.

For many years this publication has been accepted as the standard reference book for the methods of analyzing products which come more or less directly under the supervision of the Department of Agriculture. The headings of the different sections given below will immediately indicate the wide scope of this book. This Fifth Edition brings all of the methods and material of the previous editions up to July 1, 1940.

When the Second Edition was published in 1924 Dr. H. W. Wiley said, "The most valuable contribution made to agriculture in the last forty years has been that of the standardization of the chemical and physical methods of research in agriculture by this Association."

The first issue of these methods was a bulletin of fifty printed pages, and the present volume contains over 750 pages which alone is an indication of the remarkable growth of the activities of the Association of Official Agricultural Chemists.

This book is a valuable if not an absolute necessity to laboratories who are performing analyses relating to foods, drugs, paints, insecticides, fertilizers, coloring matters used in foods, etc.

The contents by sections follows:

I. Soils.
II. Fertilizers.
III. *
IV. Agricultural Liming Materials.
V. *
VI. Insecticides and Fungicides.
VII. Caustic Poisons.
VIII. Naval Stores.
IX. Paints, Varnishes and Constituent Materials.
X. Leathers.
XI. Tanning Materials.
XII. Plants.
XIII. Beverages (non-alcoholic) and Concentrates.
XIV. Malt Beverages, Sirups and Extracts, and Brewing Materials.
XV. Wines.
XVI. Distilled Liquors.
XVII. Baking Powders and Baking Chemicals.
XVIII. Coffee and Tea.
XIX. Cacao Bean and Its Products.
XX. Cereal Foods.
XXI. Coloring Matters in Foods.
XXII. Dairy Products.
XXIII. Eggs and Egg Products.
XXIV. Fish and Other Marine Products.
XXV. Flavoring Extracts.
XXVI. Fruits and Fruit Products.
XXVII. Grain and Stock Feeds.
XXVIII. Meat and Meat Products.
XXIX. Metals in Foods.
XXX. Nuts and Nut Products.
XXXI. Oils, Fats, and Waxes.
XXXII. Preservatives and Artificial Sweeteners.
XXXIII. Spices and Other Condiments.
XXXIV. Sugars and Sugar Products.
XXXV. Vegetables and Vegetable Products.
XXXVI. Vitamins.
XXXVII. Waters, Brines, and Salt.
XXXVIII. Radioactivity.
XXXIX. Drugs.
XL. Microbiological Methods.
XLI. Microchemical Methods.
XLII. Standard Solutions.
XLIII. Tables.

*The subject matter of Chapters III, Sewage, and V, Agricultural Dust, may be studied by the Association later.

1940-41 A.S.T.M. Standards on Textile Materials. *380 pages. Obtainable from A.S.T.M. Headquarters, 260 South Broad Street, Philadelphia, Pa. Single copies* $2.00. *Above ten at reduced rates.*

Each of the sixty-five specifications of quality, tolerances, test procedures, and definitions developed by the American Society for Testing Materials through the work of its Committee D-13 on Textile Materials are included in this latest compilation and in addition three proposed methods are published for information. The book also includes abstracts of papers presented at committee meetings and valuable tables and data. In the fore part of the book are grouped the general testing methods. Following two extensive lists of definitions of terms there are standards covering textile testing machines, determination of relative humidity, a detailed procedure for identification and determination of fibers, and various test methods covering woven fabrics, knit goods, tests for fastness to light, and two new items just approved this year—resistance of fabrics to moths and to water.

A new addition to the group covering asbestos covers specification requirements and tests for asbestos cloth. The other specifications cover roving yarns and tape.

Twenty-two of the 65 standards cover cotton products including test for shrinkage, fastness to washing, general methods of testing cotton fiber, yarns, threads, hose and belt ducks, numbered ducks, carded gray goods, broadcloth, tubular sleeving and braids, tire cord and fabrics, and various types of tape. In the so-called household field are requirements for blanketing, sheeting, and toweling.

Four new standards for glass textiles are included for the first time covering glass yarn, fabrics, tubular sleeving and braids (woven), and glass tapes.

There are seven standards covering tests and specifications for rayon. Two cover jute yarn and jute sugar bags, and eleven relate to wool including methods and specifications for fineness of wool tops, tests for fiber length, methods and tolerances for woolen and worsted yarns, pile floor covering, wool felt, certain wool and part wool fabrics, and yarns spun from wool mixed with fibers other than wool; also included are the methods for shrinkage of grease wool.

The committee has again included in the Appendix its valuable section on photomicrographs of common textile fibers, yarn number conversion table, the psychrometric table for relative humidity, and a glossary of terms relating to textile materials which this year includes a section on defects in woven fabrics. Also given for information are three proposed methods, which have not yet been approved by the committee, pertaining to accelerated ageing of textiles, quantitative determination of tussah silk in mixtures with other fibers and the quantitative analysis of textiles composed of wool and lanital.

The papers abstracted cover the use of synthetic organic materials in textile finishing, influence of locality of growth and season on the fiber and spinning properties of two varieties of cotton (crop years of 1936 and 1937), and the standardization of color names.

• CLASSIFIED • ADVERTISEMENTS

WANTED: SPECIALTY SALESMEN OR REPRESENTATIVES—Coast-to-Coast—To sell established line of synthetic detergents and textile finishes—to jobbers, chemical manufacturers and textile mills. Exceptional commission basis. Protected territory. Only men with chemical experience and following need apply. Box No. 279, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: TEXTILE CHEMIST—Permanent position for graduate chemist, chemical engineer or equivalent. Should have experience in analysis of textile chemicals and dyes, also their application to textiles. Must be native born American citizen. State age, religion, experience and salary desired. Our employees know of this vacancy. Box No. 280, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: LABORATORY MAN. For Dye Testing, including Naphthols and Vat Colors. Position in New England States. Write Box No. 281, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Textile Chemist, B.T.C. degree Lowell Textile Institute. Experienced as chemist on cotton, rayon and wool; as chemist spotter, dry cleaner and garment dyer, chief agricultural chemist and special federal inspector on cotton, rayon and woolens. At present employed. Age 32. Married. Drafted and placed in Class III with dependents. Prefer textile chemical, testing or research. Write Box No. 282, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Pile Fabric Dyer. I am only 40 years old but have had 18 years of practical experience in the dyeing of Pile Fabrics, involving rayon, cotton and mohair blends going into upholstery, draperies, cloakings and automobile fabrics. I am immediately available; will go anywhere in the United States where opportunity and future can be assured. My references are the best. My work speaks for itself. Write Box No. 283, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Jig Dyer—Experienced in matching rayons and acetates. State experience and salary required. Write Box No. 284, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Chemist—With 3 or 4 years' experience in dyehouse laboratory. Must be able to evaluate dyestuffs, analyze textile fibers, match samples quickly and accurately. State salary required. Write Box No. 285, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.